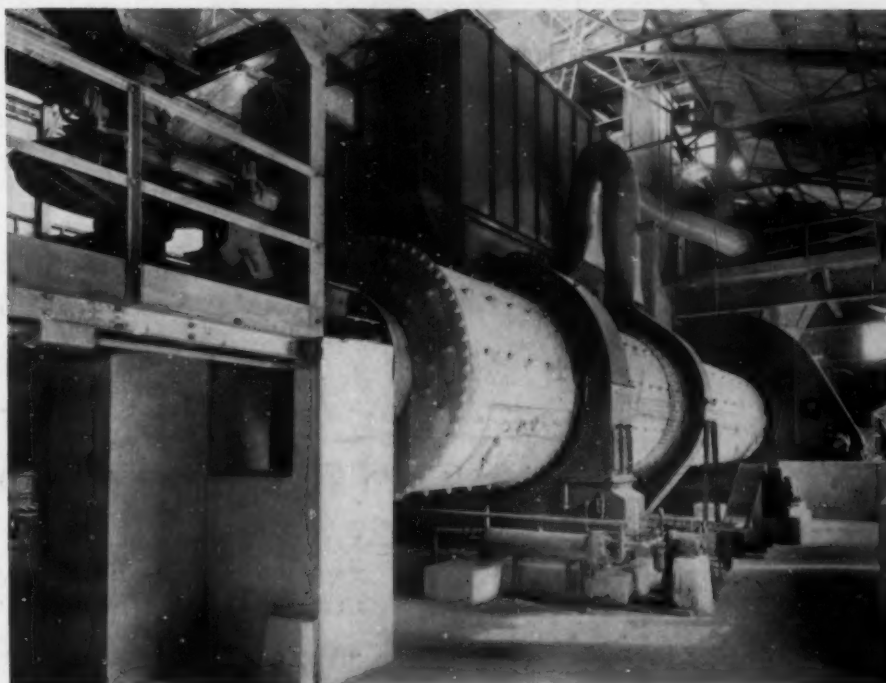


Rock Products

THE INDUSTRY'S RECOGNIZED AUTHORITY

GRINDING MACHINERY



KOMINUTER
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Wet grinding or dry grinding—open or closed circuit—gravity discharge or air swept—combined drying and grinding—direct firing or bin system.

Also a complete line of accessories for the grinding operation such as air separators and classifiers, Trix wet separator, fans, liners, grinding bodies, spray casings, symetro gear boxes, feeders, conveyors, pumps, dust casings, washmills, etc.

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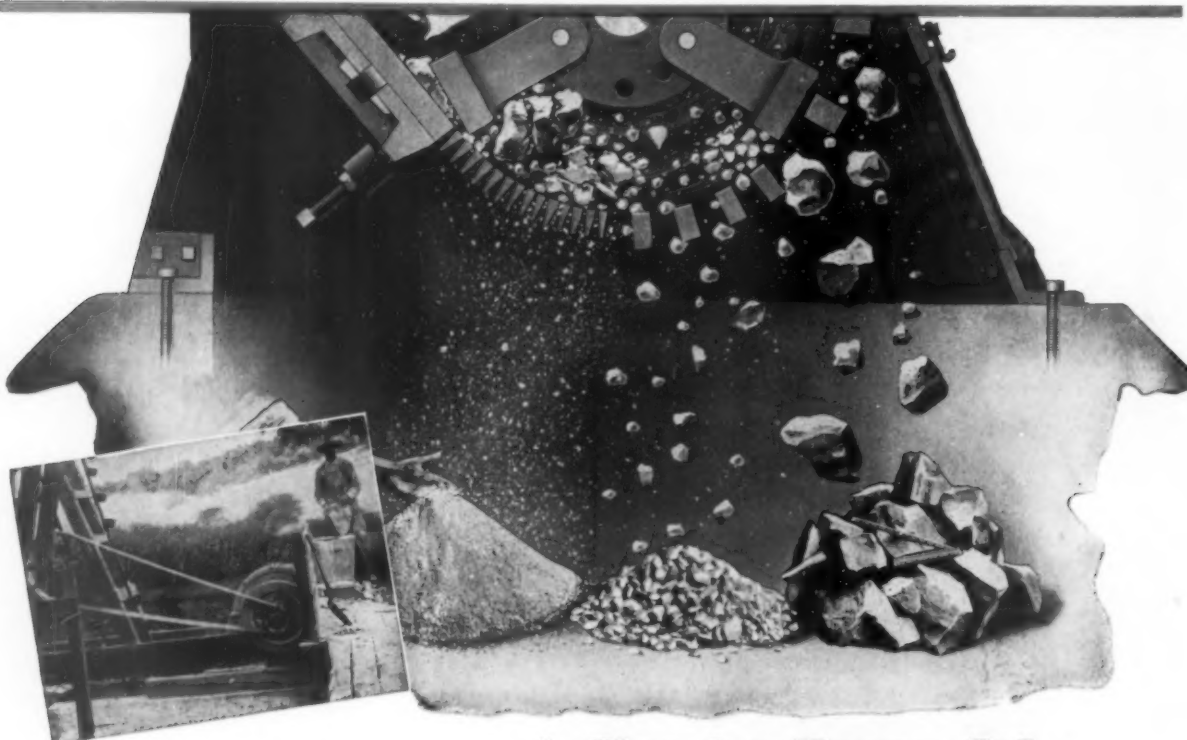
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Handle Larger Rock • 50% Less Investment • Better Product



The "Jumbo Jr." which reduces "one-man" size limestone to 1", 3/4" or agstone.



Feed opening of the "Mammoth" crusher which crushes 48" rock to 1" in one operation.

A Size for Every Job

The "Mammoth" crushes 48" rock to 3", 2" or 1" in one operation. Takes the place of a primary breaker and recrusher.

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The "Jumbo Jr." crushes screen rejects or "one man" size rock to 1", 3/4", 1/2" and finer.

The "NF" type is supreme as a recrusher for reducing 5" stone to 1", 1 1/2" and agricultural limestone.

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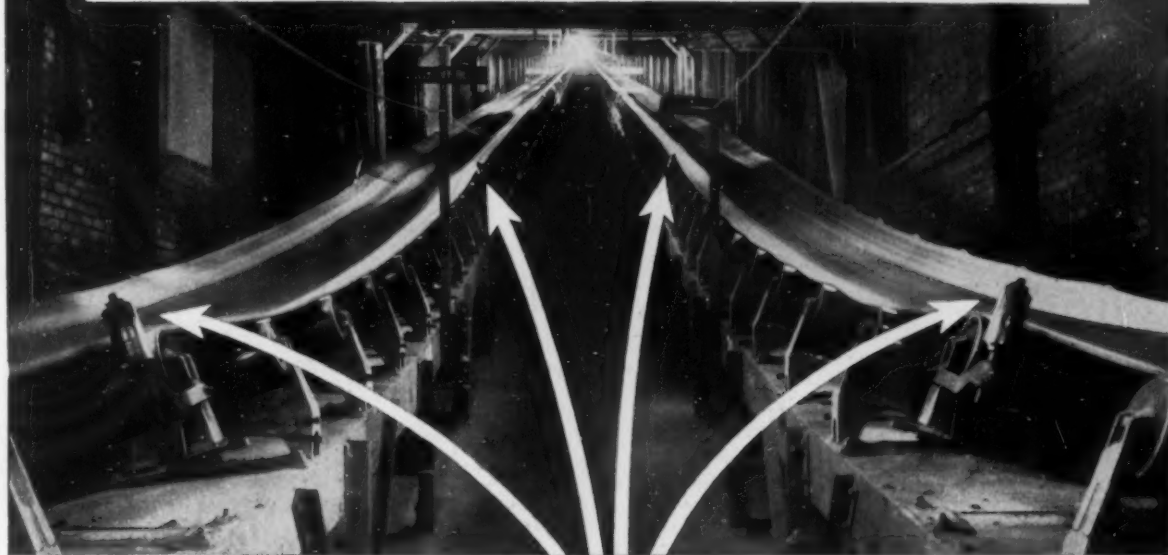
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326 RIALTO BLDG.



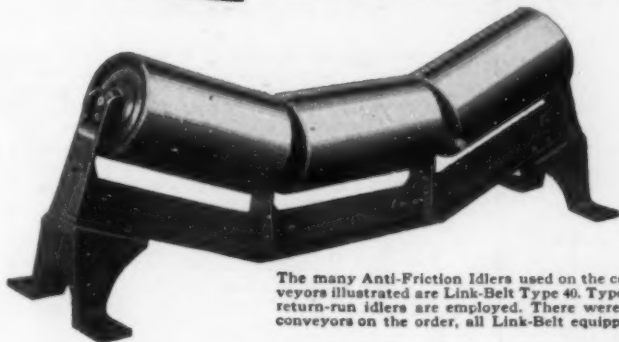
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WILLIAMS
OLDEST AND LARGEST BUILDERS OF HAMMERMILLS IN THE WORLD
WILLIAMS
PATENT CRUSHERS GRINDERS SHREDDERS

Economize with **LINK-BELT** ANTI-FRICTION CONVEYORS



These are the Link-Belt Positive Self-Aligning Idlers, spaced at suitable intervals, that automatically maintain the conveyor belt in a central carrying position without injury to its edges.



The many Anti-Friction Idlers used on the conveyors illustrated are Link-Belt Type 40. Type 41 return-run idlers are employed. There were 29 conveyors on the order, all Link-Belt equipped.

● Good idlers are of vital importance to satisfactory belt conveyor operation. They preserve the belt, reduce power requirements and maintenance expense, and give long trouble-free service. Link-Belt Anti-Friction Idlers are the product of years of specialization in this field. Among the more recent developments is the Link-Belt Positive Self-Aligning Idler for automatically maintaining the proper position of belt. Submit your conveyor problems to Link-Belt, and let us furnish you the style and type of equipment that will bring you the best results. Catalog sent on request.



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The Leading Manufacturer of Equipment for Handling Materials and Transmitting Power

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With which has been consolidated the journals

CEMENT and **ENGINEERING CONCRETE**
NEWS PRODUCTS
Founded 1896 Est. 1918

RECOGNIZED THE WORLD OVER AS THE LEADER IN ITS FIELD

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ROCK PRODUCTS
Bears the Twin Hall-Marks
of Known Value



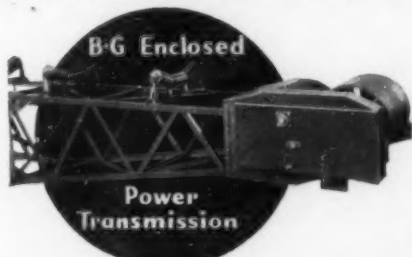
Impartial measurement of
reader interest in terms of
paid circulation

Authentic facts relating to
editorial scope and reader-
ship analysis

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Via Barber-Greene

Here are two new Barber-Greene
doing a perfect job in an ideal plant.



The conveyor on the right is 160' long, with a Barber-Greene steel truss 42" deep. This conveyor not only has fairly long spans but carries an 8" water pipe in addition to the walkway.

The left conveyor, which runs horizontally just above the ground, is mounted on wood stringers as no long spans are necessary.

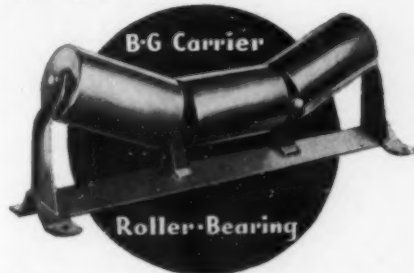
Both conveyors are driven by the new Barber-Greene enclosed transmission, an all-welded steel unit, dust tight, internally lubricated. This transmission is available in two sizes, has highest quality anti-friction bearings and precision-made steel gears and sprockets.



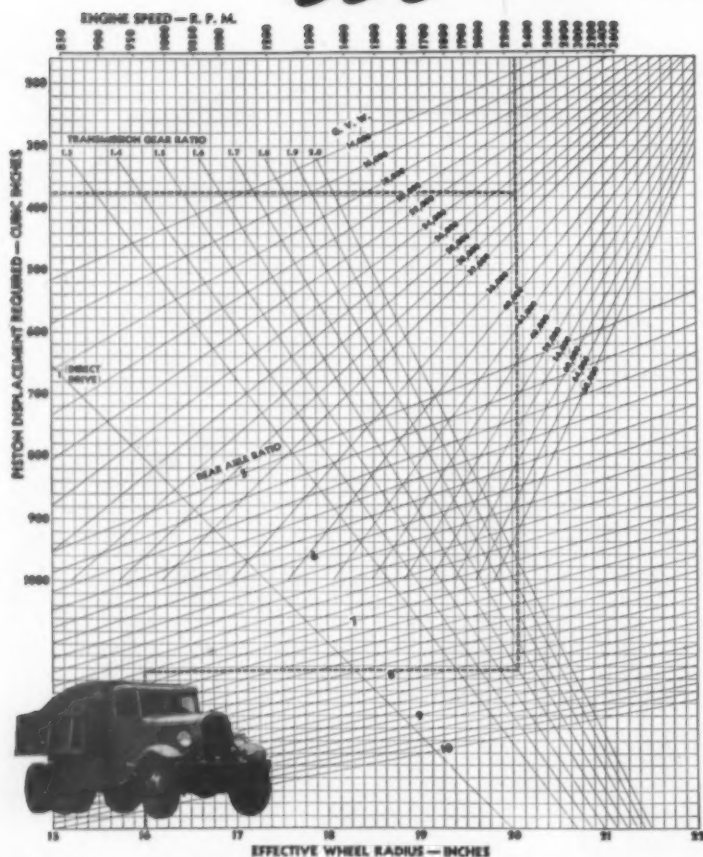
The new Barber-Greene 42" deep welded steel truss has all the well known B-G advantages, standardized sectional construction, quick easy erection, etc.

The carriers on both conveyors are the finest made by Barber-Greene: Unbreakable, all-welded steel base, end brackets die formed, oversize Shafer Self-Aligning Roller Bearings. FOUR pass labyrinth grease seals keep the grease in and grit out.

The carriers alone justify your inquiry. Send a card or letter today for full information on Barber-Greene conveyors. Remember we maintain a department for the sole purpose of solving your material handling problems the most efficient, economical way. There is no obligation. Barber-Greene Company, 459 West Park Avenue, Aurora, Illinois.



Taking a 4% Grade at 20 M.P.H.



This Chart reproduced by courtesy of Commercial Car Journal.



The more you demand of your fleet, the more it demands of the lubrication it gets. It can be proved that you can reduce overhauling expense, get full power from your truck engines, if you will use New Texaco Motor Oil.

SOUNDS EASY, BUT...

SIMPLE as it seems, many of those fleet operators who participated in Commercial Car Journal's recent survey admitted that only part of their fleet could meet this ratio. Even though your engines have sufficient piston displacement to do this, you can be sure of getting full power only when they are kept in top condition... clean... as they will be if you use New Texaco Motor Oil.

New Texaco Motor Oil is more than just another oil. It is refined by the Furfural Process... purified by furfural, a farm product made from corn, oats, cotton seed, etc. The Furfural Process frees oil from harmful tarry, gummy, sludge-forming elements. The result is an oil that is all lubricant, oil that keeps engines *clean*, rings and valves free, compression high, power output at peak!

Trained automotive engineers are available for consultation on the selection and application of Texaco Automotive Products. Prompt deliveries assured through 2108 warehouse plants throughout the United States. The Texas Company, 135 East 42nd Street, N. Y. C.

● By means of the chart at left, above, it is possible to find the piston displacement a truck engine must have in order that a truck of any gross weight may ascend a grade of 4 per cent at 20 m.p.h.

Locate on the bottom scale the point corresponding to the distance from the center of the driving wheel to the ground with the truck fully loaded. From this point proceed up to the point of intersection with the inclined line representing the rear axle ratio.

From this point pass horizontally to the right (or left) to the point of intersection with the transmission-gear ratio, that is, the ratio of the particular gear in the transmission which must be used in order to make 20 m.p.h. up to the 4 per cent grade.

From this point pass vertically up (or down) until intersecting the inclined line representing the gross vehicle weight.

By passing from the latter point horizontally to the scale on the left side of the chart, you can read off the piston displacement required, whereas by passing vertically up to the scale at the top you can read off the speed at which the engine will turn over when the truck is making 20 m.p.h. in this gear.

☆☆☆

Excerpts of article by P. M. Heldt, Engineering Editor, appearing on page 26 of Commercial Car Journal, December, 1937.



NEW **TEXACO** MOTOR OIL

ROCK PRODUCTS

**WE MACWHYTE MEN ARE
ALWAYS**

*on the
alert!*



LOOK FOR THE
Whyte Strand

MACWHYTE
WHYTE STRAND
IS BETTER
BECAUSE IT'S MADE
BY SPECIALISTS

**MACWHYTE
COMPANY**
KENOSHA, WISCONSIN

Manufacturers of wire rope and
braided wire rope slings.
Distributors and stock throughout
the U. S. A. for quick service.

● "We don't find trouble often," says Walter Bloxdorf, veteran Macwhyte metallurgist, "but when we do, even though it's the smallest defect, we discard the whole coil of wire. It's never used in making Macwhyte Wire Rope."

"As soon as rods arrive at the Macwhyte Wire Mill we make our first laboratory tests. We examine their grain structure and size under the microscope. We determine the proportion of elements by chemical analyses. And then we give rods a hot acid test, which shows up any impurities."

"But that's only the first lab test, the *easy* test. After rods have been sent through heat-treating, 'pickling' and cold-drawing in the wire mill, they come back again to the lab for further testing—including fatigue resistance tests, torsion tests, and tests of tensile strength."

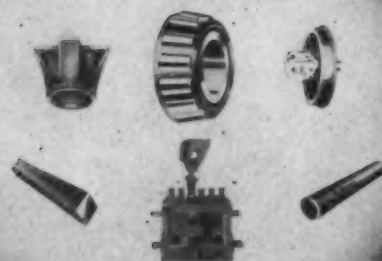
"Any wire that can pass all these tests is really good wire—wire that makes Whyte Strand PREformed wire rope stand the toughest going."

MACWHYTE
Whyte Strand - PREformed

THE WIRE ROPE WITH THE INTERNAL LUBRICATION

"TIMKEN"

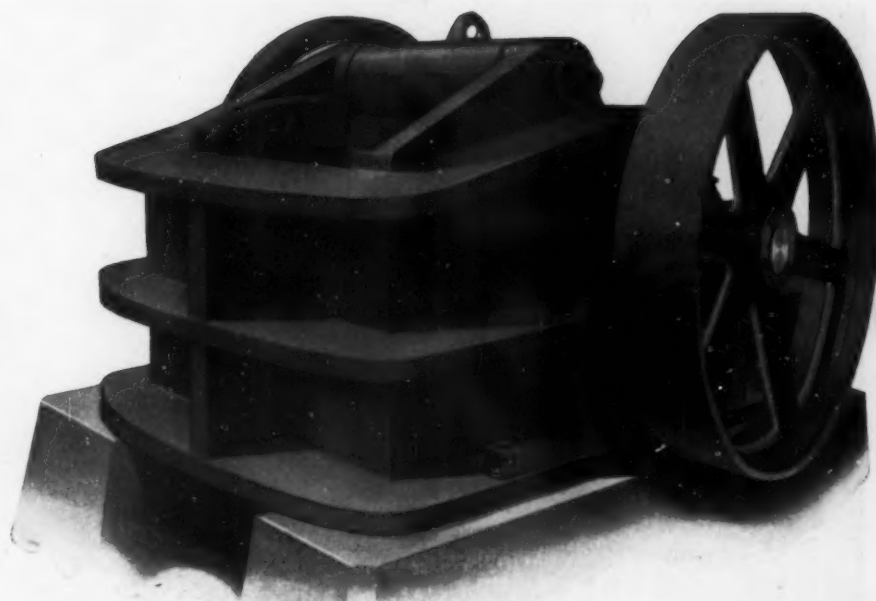
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A world-famous trade-mark identifying the products of one of the world's leading engineering-manufacturing institutions . . . TIMKEN Tapered Roller Bearings, TIMKEN Alloy Steels, TIMKEN Seamless Steel Tubing, TIMKEN Rock Bits and TIMKEN Fuel Injection Equipment for compression-ignition engines.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

"two
blades
of
grass"



Crushers have nothing to do with the growing of grass, of course, but the

TRAYLOR TYPE H JAW CRUSHER

WE BUILD

Rotary Kilns
Rotary Coolers
Rotary Dryers
Rotary Slakers
Scrubbers
Evaporators
Jaw Crushers
Gyratory Crushers
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Crushing Rolls
Grinding Mills
Ball Mills
Rod Mills
Tube Mills
Pug Mills
Wash Mills
Feeders
Rotary Screens
Elevators

Welded or Riveted
Stacks, Tanks and Bins
for any purpose.

will produce two tons of crushed stone to one capable of being secured by the use of older designs of Blake Type Jaw Crushers with straight jaw plates. And it will deliver a much finer sized product in such quantity at no increase in horsepower—not only WILL, but HAS done it, and IS doing it!

That means cutting the power-per-ton cost more than in two—no mean saving—and, as a desirable attending advantage that costs nothing at all, the product is more uniform.

The Type H Crusher is a simpler, lighter, yet stronger (the full welded steel frame does that) breaker than you ever have seen, and that, of course

means less upkeep expense—another headache cured!

These advantages are not reserved for the purchasers of a new crusher alone,—ANY jaw crusher may be fitted with the salient feature of the Type H that assures doubled output at no extra expense. Many installations of this kind have been made.

You'll want to know all about this new development, of course, and we very much want to tell you all about it, so why not have our man around for a talk? At least send, at once, for our Bulletin 105.

Write us today!

TRAYLOR ENGINEERING & MANUFACTURING CO. ALLENTOWN, PENNSYLVANIA, U.S.A.

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1. A limber rope—one that is easy to handle ☐
2. A rope that is quickly installed ☐
3. A rope that is largely "broken in" before you put it to work ☐
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6. A rope that spools evenly and runs smoothly ☐
7. A rope that is quickly, easily, perfectly spliced and socketed ☐
8. A rope that can be handled with more than ordinary safety ☐
9. A rope that lasts exceptionally long ☐
10. A rope that saves you money ☐



How many did you check? If more than five—any five—the chances are that "Flex-Set" Preformed Yellow Strand is your best buy.

Preforming shapes the strands during manufacture to the helical form they will maintain in the rope—with the amazing results listed above. The original "well-balanced" properties of Yellow Strand are *still there*—plus the advantages gained by preforming.

Items 2 and 3 above are *specially important* on equipment whose ropes are renewed more or less frequently. "Flex-Set" Preformed Yellow Strand costs less to install; can be speeded up under full load in less time; lasts longer. Try "Flex-Set" Preformed Yellow Strand on power shovels, for hoist line, crowd rope, rack rope; on dragline machines, for dragline and hoist line; on clamshell buckets, for holding line and closing line.

Broderick & Bascom Rope Co.
ST. LOUIS

Factories: St. Louis—Seattle—Peoria
Branches: New York—Chicago—Seattle—Portland—Houston

No. U-7R2

"Flex-Set" Preformed Yellow Strand

A PROVEN *Business Opportunity* FOR 1938

From many towns of a few thousand population to the largest cities, the ever-growing demand for Jaeger Dual-Mix Higher Strength Concrete, replacing bulk materials, offers one of the outstanding opportunities for sound and profitable new business investment and the expansion of existing concrete plants.



HERE IS HOW DEMAND FOR JAEGER TRUCK-MIXED CONCRETE GROWS AND GROWS

These 25 Typical Operators Have Ordered and Reordered an Average of 5 Times Each,
for a Total of 409 Jaeger Units

Atlanta Aggregate Co., Inc., Atlanta, Ga.	Has Placed	3 Orders, for a Total of 6 Jaeger Units.
Beckley-Myers, Springfield, Ohio	Has Placed	3 Orders, for a Total of 5 Jaeger Units.
C. W. Blakeslee, New Haven, Conn.	Has Placed	4 Orders, for a Total of 10 Jaeger Units.
W. H. Brant & Sons, Inc., West View, Pa.	Has Placed	5 Orders, for a Total of 5 Jaeger Units.
Brooks-Wright, Inc., Paterson, N. J.	Has Placed	3 Orders, for a Total of 4 Jaeger Units.
J. P. Callaghan Co., Newark, N. J.	Has Placed	4 Orders, for a Total of 17 Jaeger Units.
Clark Transportation Co., Honolulu, H. I.	Has Placed	4 Orders, for a Total of 12 Jaeger Units.
Cline & Ellis, Raleigh, N. C.	Has Placed	2 Orders, for a Total of 6 Jaeger Units.
Consolidated Rock Products Corp., Los Angeles, Calif.	Has Placed	2 Orders, for a Total of 14 Jaeger Units.
Dufferin Paving & Crushed Stone Co., Ltd., Toronto, Ont.	Has Placed	4 Orders, for a Total of 26 Jaeger Units.
Fort Worth Sand & Gravel Co., Ft. Worth, Tex.	Has Placed	5 Orders, for a Total of 17 Jaeger Units.
Goff-Kirby Co., Cleveland, Ohio	Has Placed	3 Orders, for a Total of 10 Jaeger Units.
Graham Bros., Los Angeles and Long Beach, Calif.	Has Placed	6 Orders, for a Total of 16 Jaeger Units.
Haden Co., Houston, Tex.	Has Placed	10 Orders, for a Total of 22 Jaeger Units.
Howard Concrete Producing Co., Cincinnati, Ohio	Has Placed	10 Orders, for a Total of 21 Jaeger Units.
Keefner Concrete Co., Des Moines, Ia.	Has Placed	8 Orders, for a Total of 11 Jaeger Units.
Knoxville Sangrati Material Co., Knoxville, Tenn.	Has Placed	4 Orders, for a Total of 6 Jaeger Units.
Kuhlman Builders Supply & Brick Co., Toledo, Ohio	Has Placed	9 Orders, for a Total of 16 Jaeger Units.
P. W. Lambert & Co., Linden, N. J.	Has Placed	3 Orders, for a Total of 7 Jaeger Units.
Maloney Concrete Corp., Washington, D. C.	Has Placed	7 Orders, for a Total of 44 Jaeger Units.
J. & I. O'Rourke, Flushing, L. I.	Has Placed	6 Orders, for a Total of 28 Jaeger Units.
Richter Transfer Co., Cincinnati, Ohio	Has Placed	12 Orders, for a Total of 40 Jaeger Units.
Ryan Ready-Mix Concrete Co., Brooklyn, N. Y.	Has Placed	7 Orders, for a Total of 22 Jaeger Units.
H. L. Seabright Co., Wheeling, W. Va.	Has Placed	18 Orders, for a Total of 22 Jaeger Units.
Warner Co., Philadelphia, Pa.	Has Placed	8 Orders, for a Total of 22 Jaeger Units.

Jaeger Truck Mixers and Agitators give you a **RECOGNIZED ADVANTAGE** in selling ready-mixed — a stronger, more workable concrete, preferred by both engineers and contractors, produced by the most efficient, low cost mechanism ever developed for mixing and delivering concrete. Write for our Catalog. Its information is authoritative and complete. **THE JAEGER MACHINE CO., 803 Dublin Avenue, Columbus, Ohio.**

JAEGER

BUILT IN 1½-2-3-4-5-6 CU. YD. SIZES — END OR SIDE DISCHARGE



Announcement!



25 REASONS FOR CHOOSING BAY CITY

- 1—Convenient economical weight.
- 2—Helical cut gears—noiseless, long wearing.
- 3—Unit (nickel-manganese) ear body and machinery table, totally heat treated.
- 4—Anti-friction bearings thruout.
- 5—6-cylinder power.
- 6—Extra large diameter swing roller-path.
- 7—Oversized clutches and brakes.
- 8—Drop forged crawler shoes.
- 9—Long crawlers—low bearing pressure.
- 10—Chain crowd with automatic adjustment.
- 11—Swing lock—in any cab position.
- 12—Automatic Travel lock.
- 13—Extra heavy cab. Plenty inside working room.
- 14—Fast operating speeds.
- 15—Two travel speeds.
- 16—All-steel construction.
- 17—Three-lever control.
- 18—E-Z clutch control.
- 19—High pressure lubrication thruout.
- 20—Safety worm boom hoist.
- 21—Separate hoist drums.
- 22—Internal swing teeth.
- 23—Unequaled steering at full speed.
- 24—Convertible—without machinery change.
- 25—Accessibility for inspection or adjustment.

Shown for the first time at the Cleveland Road Show, the new Model 25, BAY CITY $\frac{1}{2}$ yard shovel attracted real attention from contractors and engineers who demand a fast, economical and efficient power shovel that is fully convertible and a real yardage producer.

If you did not see this 25,000 lb. go-getter—a shovel with the well known powerful BAY-CITY Chain Crowd—a shovel with Unit Cast Alloy Construction and Anti-Friction Bearings through-out—a shovel with all the many features of standard BAY-CITY design based on quality and performance, write for new catalog and descriptive literature.

You cannot equal BAY-CITY value or performance—regardless of price. There is no obligation for you to learn why BAY CITY shovels give more yardage at low cost—WRITE TODAY.

10 OTHER SIZES— $\frac{3}{8}$ to $1\frac{1}{4}$ YARD.—ALSO TRUCK MOUNTED.

BAY CITY SHOVELS, INC.

BAY CITY, MICH.

WANTED!

5,000,000 TONS OF STABILIZED AGGREGATES

WHO'S going to fill this order, a conservative estimate of the stabilized mixture that will be required during 1938 by state, county, township and city road organizations and by private enterprises?

It's the aggregates producer's field—his new source of added profits—if he takes advantage of it.

Already the Michigan State Highway Department has contracted for 302,560 cubic yards of plant-mixed stabilized gravel, for use in maintenance on state roads alone. All maintenance gravel used by this state is now pre-stabilized with clay and calcium chloride before it is used on the roads. In awarding contracts for the 1938 construction of 185 miles of stabilized base courses, for which 232,709 cubic yards of stabilized gravel will be required, Michigan again stipulated that the material must be plant-mixed. Adding to this the fact that the state, county, township and city organizations will build many miles of stabilized roads, streets, alleys and pavement shoulders, it is safe to predict that, in this one state alone, 1,000,000 tons of calcium chloride stabilized mixture will be used this year. The market is just as great in other states, many of whom already have stabilization programs as large as Michigan's.

From all indications, the use of loose gravel for road surfaces or base courses will soon be obsolete, and the alert aggregates producer will put himself in a position to supply pre-mixed stabilized material **THIS SPRING**.

FOR:

Maintenance of State Roads
Farm-to-Market and Secondary Roads
Base Courses on Primary Highways
Streets and Alleys
Pavement Shoulders
Park and Cemetery Drives
Residential and Private Drives
Parking Areas
Amusement Parks, Race Tracks, etc.



ABOVE:
Screening materials at pit.



RIGHT:
The pug-mill—heart of the mixing plant.

WRITE FOR DETAILS—Learn how you can take advantage of this opportunity for new profits, by writing **TODAY** to any of the firms listed below. Just say, "I'd like to know more about the stabilized-aggregates business".

CALCIUM CHLORIDE ASSOCIATION

Michigan Alkali Co., 60 E. 42nd St., New York City
Solvay Sales Corp., 40 Rector St., New York City
The Columbia Alkali Corp. • • Barberton, Ohio
The Dow Chemical Company, Midland, Michigan

CALCIUM CHLORIDE

FOR STABILIZING ROAD SURFACES

... after
thorough investigation
and point-by-point com-
parison of construction
and performance features,
leaders in the ready
mixed concrete industry
choose

BLAW-KNOX TRUKMIXERS



Compare Values
Before YOU Buy

... the closest scrutiny will convince you
and justify your selection of Blaw-Knox
TRUKMIXERS and AGITATORS.

BLAW-KNOX DIVISION
OF BLAW-KNOX CO.
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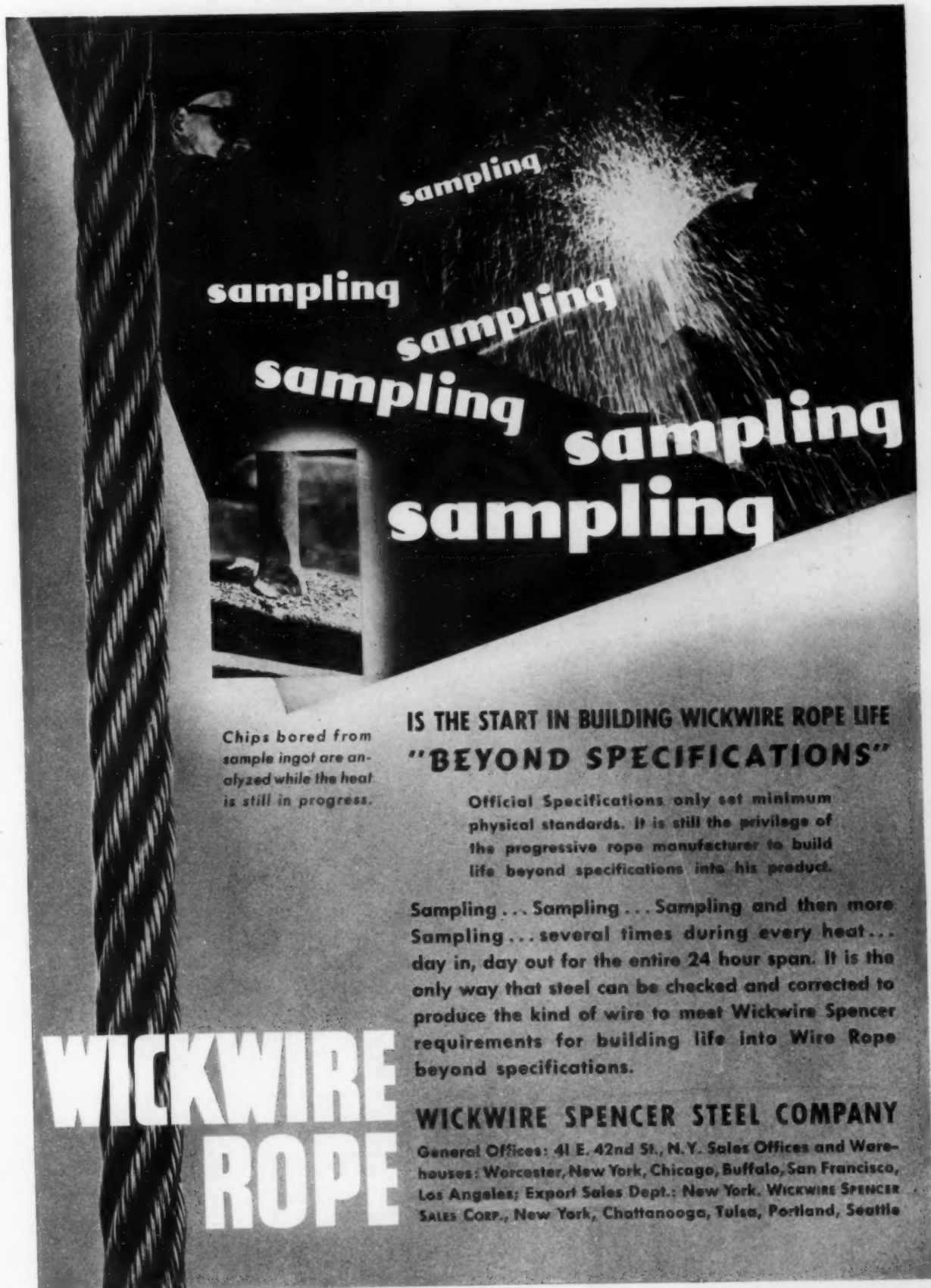
McCRADY-RODGERS CO.
PITTSBURGH, PA.

LOIZEAUX BUILDERS SUPPLY CO.
ELIZABETH, N. J.

SUPER CONCRETE CORP.
WASHINGTON, D. C.



Completely described
in the New Blaw-Knox
catalog No. 1582.
SEND FOR IT



sampling
sampling
sampling
sampling
sampling

Chips bored from sample ingot are analyzed while the heat is still in progress.

IS THE START IN BUILDING WICKWIRE ROPE LIFE "BEYOND SPECIFICATIONS"

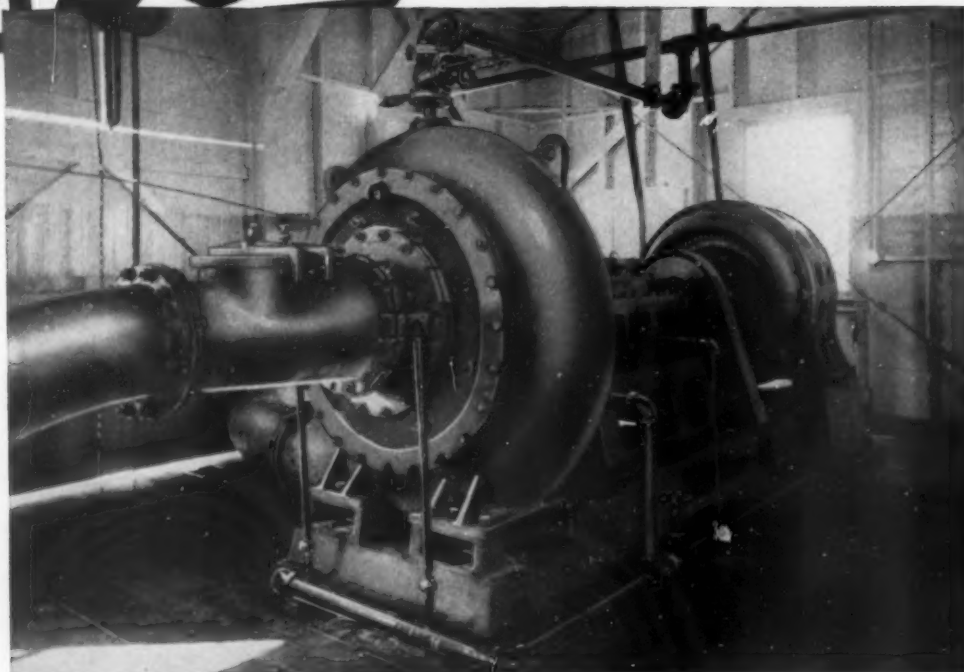
Official Specifications only set minimum physical standards. It is still the privilege of the progressive rope manufacturer to build life beyond specifications into his product.

Sampling... Sampling... Sampling and then more Sampling... several times during every heat... day in, day out for the entire 24 hour span. It is the only way that steel can be checked and corrected to produce the kind of wire to meet Wickwire Spencer requirements for building life into Wire Rope beyond specifications.

WICKWIRE ROPE

WICKWIRE SPENCER STEEL COMPANY
General Offices: 41 E. 42nd St., N.Y. Sales Offices and Warehouses: Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles; Export Sales Dept.: New York. WICKWIRE SPENCER SALES CORP., New York, Chattanooga, Tulsa, Portland, Seattle

AMSCO PUMPS



for PROFITABLE AGGREGATE PRODUCTION

5 POINTS OF SUPERIORITY!

All parts exposed to impact and abrasion are made of tough, wear resistant AMSCO Manganese Steel.

"COUNTERFLOW" Design reduces impeller and shell wear.

Threading of impeller bore and shaft provides permanent security of impeller on shaft.

Sturdily designed bearings provide maximum service over long periods.

AMSCO Design is proved by the efficient and economical performance of a thousand installations over twenty years.

Ⓐ All steels contain some manganese, but genuine manganese steel contains 10 to 14% manganese and is austenitic in metal structure, which enables it to resist impact and abrasion better than any other steel.

The quickest, most dependable and least expensive method of moving sand and gravel from deposit to washing plant is with an AMSCO "COUNTERFLOW" Pump.

Operating and maintenance costs are at a minimum where AMSCO "COUNTERFLOW" Pumps are at work because AMSCO "COUNTERFLOW" design, by means of which clear water is introduced between the impeller shrouds and the side plate liners, minimizes internal wear. Impeller bore may be threaded and screwed onto shaft to provide greater security than keying and set screws. Wide funnel-mouthed impeller reduces friction and the thrust action of liquids. Sturdy bearings are exclusively employed. And, of course, the wearing parts of AMSCO "COUNTERFLOW" Pumps are made of AMSCO Manganese Steel, "the toughest steel known," which enables them to resist the most terrific impact and abrasion in service with a minimum of wear.

Hundreds of AMSCO Pumps are in use today making money for aggregate producers and other dredging and hydraulicking operators. Owners of AMSCO Pumps built previous to the introduction of "COUNTERFLOW" design can now have them converted at a moderate cost.

AMSCO Pumps are at their best when used with AMSCO Pipe Fittings, Flap Valves and Cutterheads.

Write for a copy of the bulletin completely describing all types and sizes of AMSCO Pumps.

AMERICAN MANGANESE STEEL DIVISION

of The American Brake Shoe & Foundry Company

377 E. 14th STREET, CHICAGO HEIGHTS, ILL.

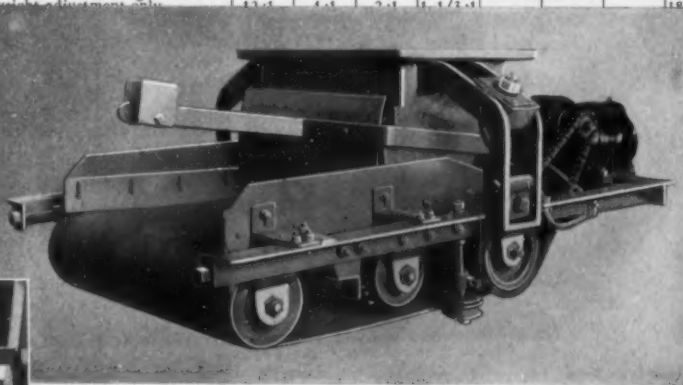
Foundries at Chicago Heights, Ill.; New Castle, Del.; Denver, Colo.; Oakland, Calif.;
Los Angeles, Calif.; St. Louis, Mo. • Offices in Principal Cities

MEMBER OF THE ALLOY CASTINGS RESEARCH INSTITUTE, INC.

★ If Feeding Is Your Problem Here's the Answer!

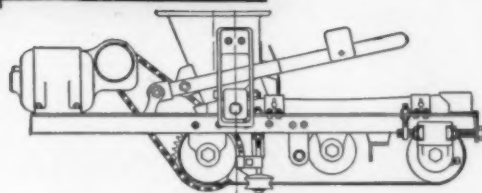
★ HARDINGE CONSTANT WEIGHT FEEDER CAPACITIES AND SPECIFICATIONS

Maximum Capacity at 85lbs. per cu. ft. (see note below)	H.P. Motors Required	Method of Regulation of Capacity	Maximum size of feed also capacity range							Size Feed Hopper	Weight Lbs.
			¾"	1"	2"	4"	8"	12"	18"		
A 2500 lbs. per hr.	1/10 H.P.	Counterweight adjustment only.....	4:1	2:1	(capacity variation range)					9"x9"	350
B 12 tons per hr.	¼ H.P.	Counterweight adjustment only.....	6:1	2:1	1-1/3:1					9"x9"	
		Variable speed (belt or motor) only.....	3:1	3:1	3:1						
		Both counterweight and variable speed (belt or motor).....	18:1	6:1	4:1						
C 200 tons per hr.	¼ H.P. below 20 T/hr. ½ HP above 20 T/hr.	Counterweight adjustment only.....	13:1	4:1	2:1	1-1/3:1				18"x18"	
		Variable speed (belt or motor) only.....									
		Both counterweight and variable speed (belt or motor).....									
D 1000 tons per hr.	½ H.P. below 15 T/hr. 1 HP 15 to 100 T/hr. 2HP above 100 T/hr.	Counterweight adjustment only.....									
		Variable speed (belt or motor) only.....									
		Both counterweight and variable speed (belt or motor).....									
E 2000 tons per hr.	½ H.P. below 5 T/hr. 1 H.P. 5 to 50 T/hr. 2 HP above 50 T/hr.	Counterweight adjustment only.....									
		Variable speed (belt or motor) only.....									
		Both counterweight and variable speed (belt or motor).....									
F 200 tons	1 H.P. below 10 T/hr. 2 H.P. above 10 T/hr.	Counterweight adjustment only.....									
		Variable speed (belt or motor) only.....									
		Both counterweight and variable speed (belt or motor).....									



Page torn out of Bulletin 41 Send for it!

THE HARDINGE CONSTANT WEIGHT FEEDER feeds by weight—not volume. You get increased tonnage, or absolute uniformity in the rate of feed, by eliminating the variation caused from change in size of material fed, bulking or bin segregation. It actually increases process capacity 10 to 20%. Two-thirds of our rapidly mounting sales volume is made up of repeat orders. Make money with this Feeder. Send for Bulletin 33-C and Bulletin 41.



HARDINGE

COMPANY INCORPORATED

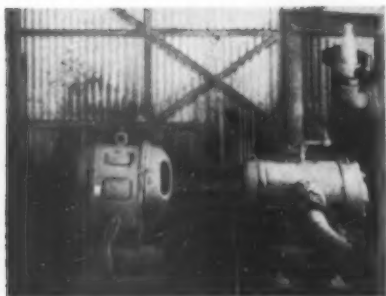
• YORK, PENNSYLVANIA, Main Office and Works

NEW YORK, 122 E. 42nd St.

CHICAGO, 285 W. Wacker Drive

SAN FRANCISCO, 501 Howard St.

DENVER, 817 17th St.



Fuller Rotary Compressor



Fuller-Kinyon Type H Pump



Fuller-Kinyon Automatic Remote-Control Unloader



Concrete Mixing and Batching Plant, Conchas Dam

UNDIVIDED RESPONSIBILITY AT CONCHAS DAM

FULLER-KINYON AUTOMATIC
REMOTE-CONTROL UNLOADER

FULLER-KINYON TYPE H PUMP

FULLER ROTARY COMPRESSOR

All of the cement used in the construction of Conchas Dam, New Mexico, (Bent Brothers, Inc. and Griffith Company, Los Angeles, California, Contractors) is being handled by Fuller-Kinyon Conveying Systems. Two types of pumps are used. The Automatic Remote-Control Unloader is used for conveying bulk cement from box cars at Newkirk, New Mexico, to truck loading bins alongside of railroad tracks. Special trucks carry the cement from Newkirk to the dam site at Conchas Dam, a distance of approximately 30 miles. Cement is spouted from the trucks to a Fuller-Kinyon Type H Stationary Pump, which conveys the cement either direct to the aggregate bin for immediate use, or to two storage bins for delivery to the mixing plant when required. A Fuller Rotary Air Compressor furnishes air for the Automatic Remote-Control Unloader at Newkirk.

Such an installation represents the ideal combination for any contractor . . . air furnished by a Fuller Rotary Compressor, bulk cement unloaded by a Fuller-Kinyon Automatic Remote-Control Unloader, and a Fuller-Kinyon Type H Stationary Pump for conveying from storage bins to mixing plant. Equipment built by one manufacturer for one particular purpose . . . no division of responsibility for the satisfactory performance of the installation as a whole.

FULLER COMPANY
CATASAUQUA, PENNSYLVANIA

Chicago: 1118 Marquette Bldg.
San Francisco: 320-321 Chancery Bldg.

P-33

FULLER-KINYON, FLUXO, AND AIRVEYOR CONVEYING SYSTEMS . . . ROTARY FEEDERS AND DISCHARGE GATES
ROTARY AIR COMPRESSORS AND VACUUM PUMPS . . . AUTOMATIC BATCH WEIGHERS . . . BIN SIGNALS

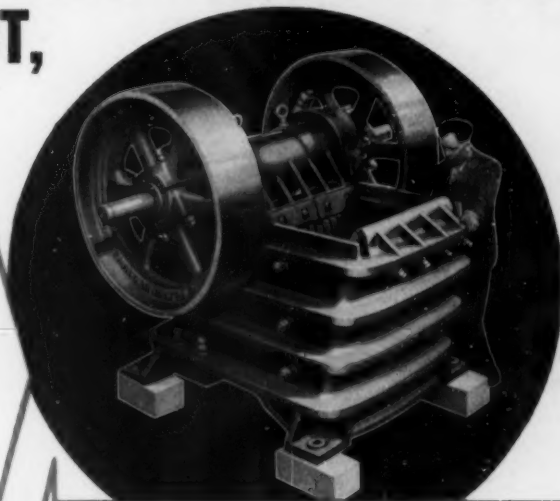
TELSMITH

**LONG LIFE, LOW UP-KEEP EQUIPMENT
BETTERS THE PRODUCT,
LOWERS THE COST**

TELSMITH - WHEELING JAW CRUSHER

This super-strong, all-steel force feed jaw crusher gives greater reduction in one process than any other type of breaker. Cylindrical roller bearings and higher speed almost double capacity without any greater expenditure for power. Two toggle settings and simple adjustment allow wide range of product sizing. Made in seven sizes. *Write for Bulletin W-11.*

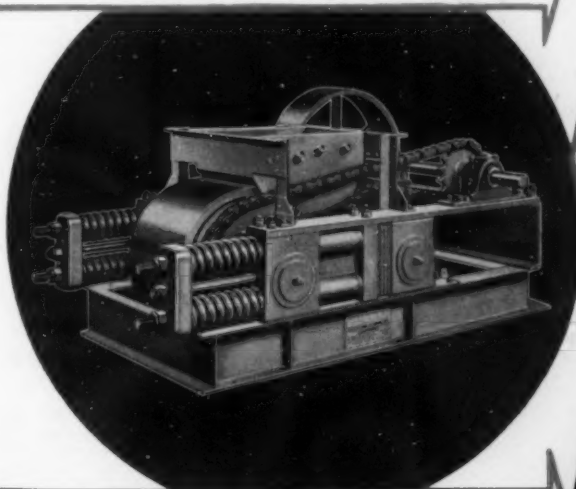
FOR COARSE CRUSHING



TELSMITH DOUBLE ROLL CRUSHER

TelSmith's latest contribution to secondary crushing is this double roll crusher, designed for quantity production of fine aggregate at moderate reduction ratios. The TelSmith Roll Crusher requires little headroom and is economical in first cost. Anti-friction bearings running in oil and spring release insure continuous operation free of break-downs. *Write for Bulletin L-11.*

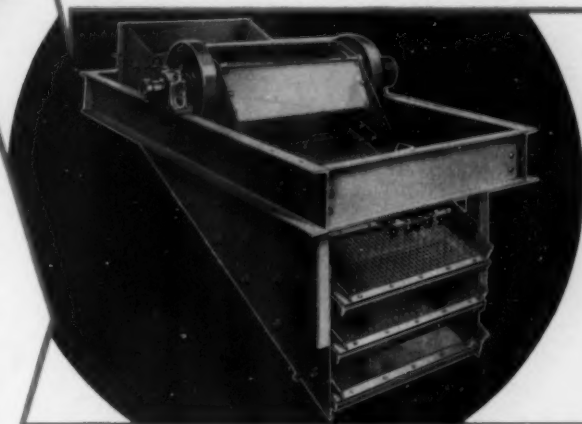
FOR SECONDARY CRUSHING



TELSMITH PULSATOR

This heavy-duty vibrating screen handles sand, gravel, crushed rock, ore or coal efficiently, wet or dry. Maximum screening action, uniform on every inch of wire, on every deck, under any load. Anti-friction bearings and special sealing devices to protect working parts insure long life and low up-keep. Made in eleven sizes in single, double, or triple deck. *Write for Bulletin V-11.*

FOR UNIFORM SCREENING



Associates in Canada: Canadian Vickers, Limited; Montreal and Vancouver
Cable Addresses: Sengworks, Milwaukee—Concrete, London

50 Church Street
New York City
81 Binney St.
Cambridge, Mass.

211 W. Wacker Drive
Chicago, Ill.
412 Westinghouse Bldg.
Pittsburgh, Pa.

713 Commercial Trust Bldg.
Philadelphia, Pa.
Brandels M. & S. Co.
Louisville, Ky.

MC-7-38

SMITH ENGINEERING WORKS, 508 E. CAPITOL DRIVE, MILWAUKEE, WIS.



THE ROCKWELL TEST, made regularly in our laboratory, checks gradation of hardness of USS Lorain Grinding Balls to assure uniform grinding and long service.

MEASURED TOUGHNESS

PRODUCTION of USS Lorain Grinding Balls is definitely controlled right through to the finished product. These balls are forged from Carnegie-Illinois *controlled steel* which has been rolled to pre-determined specifications. They are forged by experienced workmen . . . with modern equipment.

Precision in heat-treating processes is carefully guarded to produce grinding balls that are hard enough to withstand abrasion over a long period of time and yet resilient enough to prevent splintering. Long life and maximum grinding effectiveness are assured by constant checking during production and by routine laboratory tests on samples of each production. This is your guarantee that USS Lorain Grinding Balls are made *right* . . . suited to the tough wear of your grinding processes.

Specify USS Lorain Grinding Balls. They are available in the following sizes: $\frac{1}{2}$ ", $\frac{5}{8}$ ", $\frac{3}{4}$ ", $\frac{7}{8}$ ", 1", $1\frac{1}{4}$ ", $1\frac{1}{2}$ ", 2", $2\frac{1}{2}$ ", 3", $3\frac{1}{2}$ ", 4", $4\frac{1}{2}$ ", and 5".

• OTHER LORAIN PRODUCTS

Mill Liners and Screens of High Carbon Rolled Plate, Manganese, Chrome Nickel, Chrome Nickel Molybdenum, and plain Carbon Steel or Hard Iron; Hammers for Swing Hammer Mills, Industrial Cars, and Trackwork.

U.S.S. LORAIN GRINDING BALLS

CARNEGIE-ILLINOIS STEEL CORPORATION

Lorain Division

Johnstown, Pa.

Columbia Steel Company, San Francisco, Pacific Coast Distributors



United States Steel Products Company, New York, Export Distributors

UNITED STATES STEEL



*Did you know
that **GAYCO** is
first in the
Cement Industry?*

FIRST—because the original GAYCO AIR SEPARATOR made possible a material separation previously considered impossible.

NOW—whenever maximum separation of materials is required, whether 100—200—300—or 400 mesh product, GAYCO is still the first choice.

The present model contains all the latest improvements in separator design, insuring a more uniform product, greater capacity, cleaner tailings, and higher efficiency than is possible with any other Air Separator. It is built to stand up under the most severe operating conditions and give maximum service with lowest maintenance cost.

Quick, Positive Adjustment can be made for any mesh products desired from as coarse as 60-mesh to as fine as 400-mesh. Will separate practically all dry fine materials, including many that are too sticky to be screened.

One of the exclusive GAYCO features is the new type adjustable centrifugal sizing fan for rejecting coarse particles.

Write for descriptive bulletin.



Universal Road Machinery Co.

MAIN OFFICE
AND FACTORY
KINGSTON, N. Y.

Canadian Representative
F. H. HOPKINS & CO., Ltd.
340 Canada Cement Bldg.,
Montreal, Que., Can.

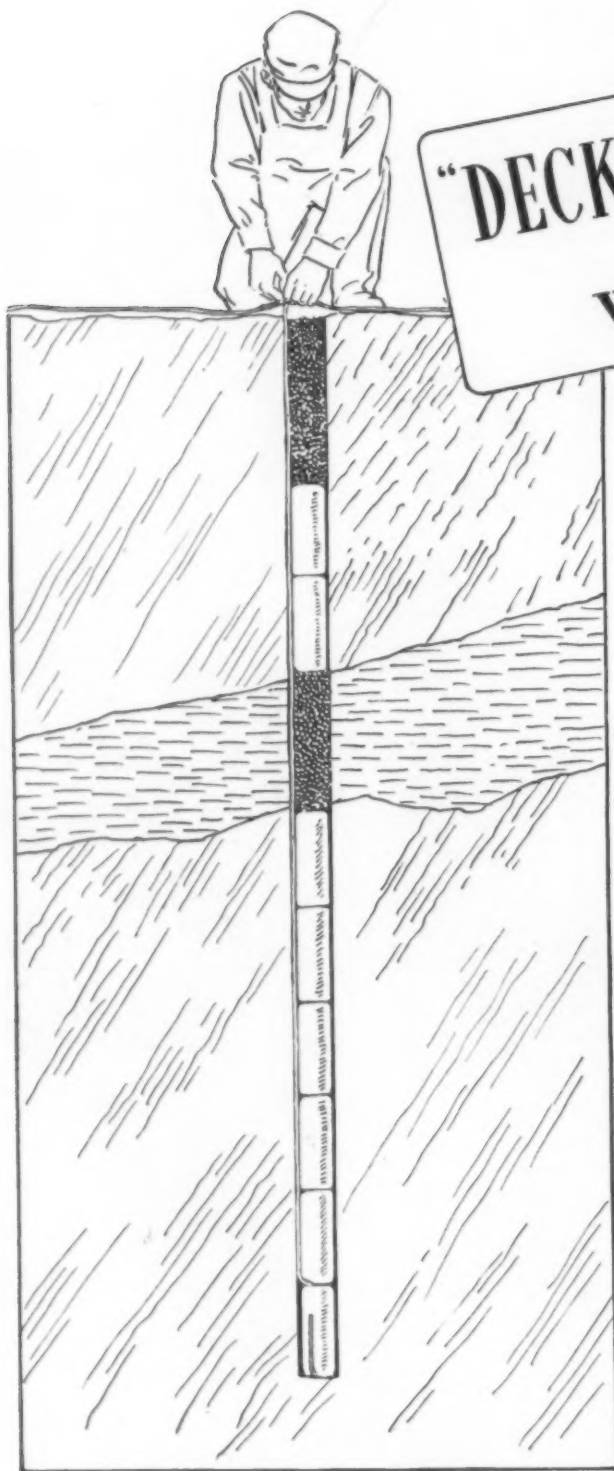


RUBERT M. GAY - DIVISION
114 LIBERTY STREET
NEW YORK, N. Y., U. S. A.



"GAYCO" CENTRIFUGAL
SEPARATORS

"RELIANCE"
CRUSHING, SCREENING
AND
WASHING EQUIPMENT



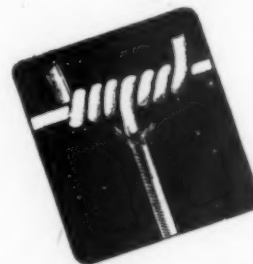
**"DECKLOADS" are simpler
with CORDEAU**



EASY as filling your pipe—that's how simple it is to use Cordeau-Bickford Detonating Fuse in "deck loads." When the first cartridge has been lowered to the bottom of the hole, the Cordeau should be drawn closely against one side to protect it from injury. Then the rest of the cartridges and the tamping material can be set in place, the fuse making a direct contact with every cartridge and acting as an instantaneous detonator for each of the separate charges when the blast is fired.

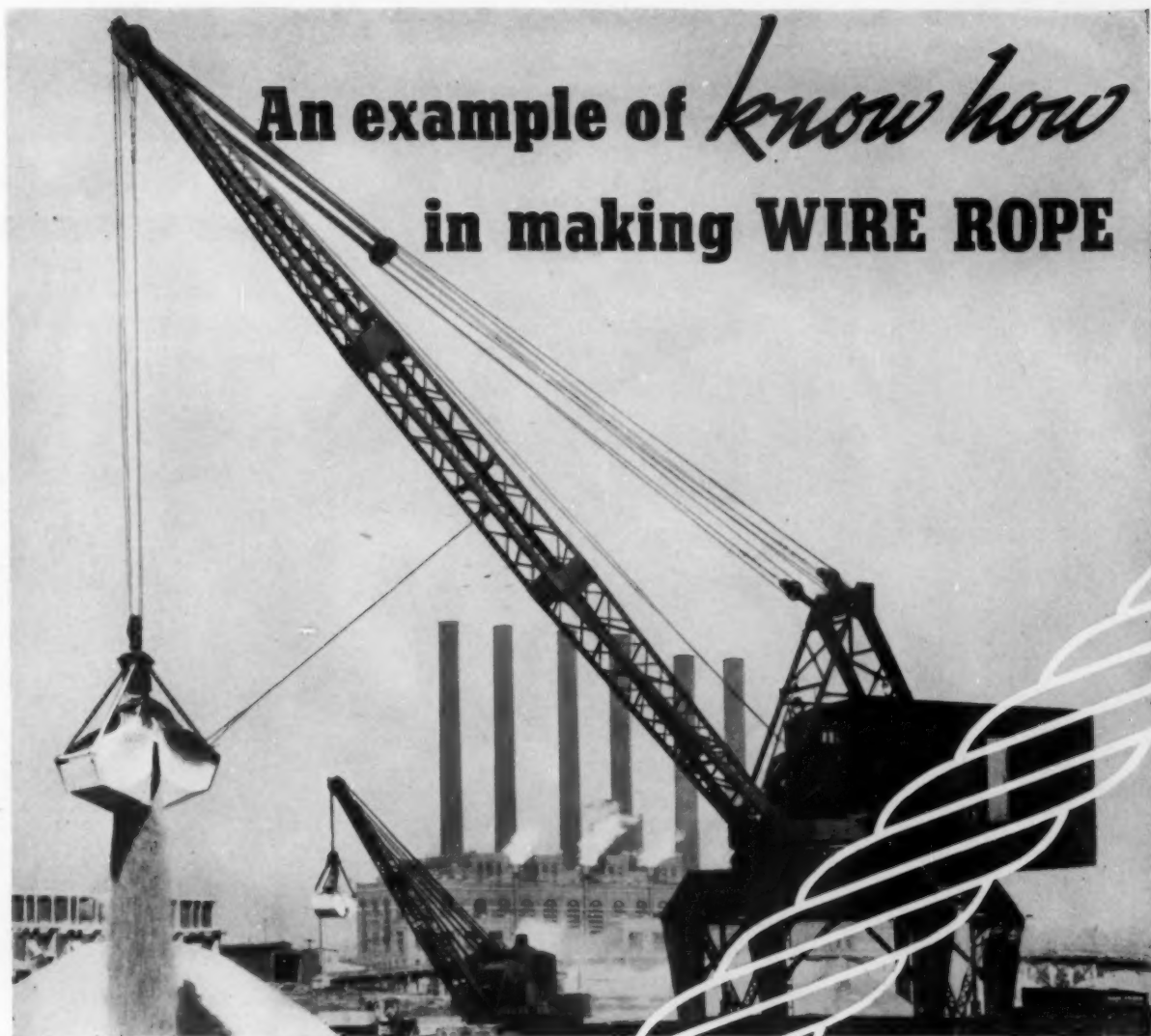
This insensitive detonator is not only easy to use but also affords maximum effectiveness. Every cartridge has the added force of a primer cartridge, resulting in better fragmentation, quicker removal and other substantial economies.

THE ENSIGN-BICKFORD COMPANY
SIMSBURY, CONN.



CORDEAU-BICKFORD *Detonating Fuse*

CB70



CLAMSHELL ROPE with resilience to it

Shock resistance is a characteristic of Bethlehem Clamshell Rope. A result, not of 6 x 25 construction, Purple Strand quality, or even preforming, but of "know how" in building the rope. For Bethlehem Clamshell Rope is built with resilience to it. Definite, measurable differences, as compared to dragline, for example, enable it to stand up under shocks and jerks that shorten the life of ordinary rope for this application.

For one thing, the lay of Bethlehem Clamshell Rope is slightly shorter than for most other ropes—allowing

an elastic "give" to the line when suddenly stressed. For another, the core is slightly over-size, giving additional support to the steel strands, and cushioning the resilience of the rope. Special internal lubrication of the core as well as of wires and strands retards damage from running fast over small sheaves. These are built-in special features in this rope—results of knowing how to build a line *for the job on which it will be used.*

Bethlehem (formerly Williamsport) Wire Rope has a background of half a century of experience in meeting the wire-rope requirements of industry, and the metallurgical knowledge of an organization making practically all kinds of steel for all industries. You can depend on it.

BETHLEHEM STEEL COMPANY





FOR OPERATING CRUSHERS

CONVEYORS

COMPRESSORS

MIXERS

PUMPS, etc.

TRACTOR-PROVED POWER UNITS

MADE IN FOUR SIZES FROM 31 TO 102 B.H.P.

The rock in this Columbia County (Wash.) pit is a lava formation, difficult to crush, but the power of husky Allis-Chalmers engines make short work of it, keep a plentiful supply of crushed rock always ready for the trucks. A Model E-60 (68 B.H.P.) operates the dragline, a Model L-90 (102 B.H.P.) powers the crusher. These engines are the same as those used in A-C tractors and have proved their ability to provide dependable, day-after-day performance under tough operating conditions the world over. Today pit and quarry operators are finding them a steady, low-cost method of operating such varied equipment as crushers, pumps, conveyors, mixers, draglines, compressors, generators, etc. Because they were designed exclusively for heavy duty use and were not restricted to a limited size space, A-C Power Units have plenty of bearing area—twice that of ordinary engines. As a result they require less adjustment and stand up to hard, punishing work for longer periods without repair. This extra bearing area, plus such other important features as inserted valve seats and removable cylinder liners, insure lower maintenance cost, greater engine efficiency and longer operating life. Ask your nearest Allis-Chalmers dealer to show you how A-C tractor-proved Power Units can lower your operating costs and increase plant efficiency.

ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

FOR LOWER-COST
OVERBURDEN
REMOVAL USE THE
FASTER POWER
OF ALLIS-CHALMERS
TRACTORS

EQUIPMENT pushed to the limit

CALLS FOR EXCEPTIONAL WIRE ROPE ENDURANCE!



Roebling "Blue Center" provides it!

Rising costs in industry make economy essential. Many concerns are cutting costs by getting the utmost work out of production and handling equipment.

If you, too, are subjecting your wire rope rigged equipment to the acid test of extra severe operating conditions—be certain that the wire rope you use will give you safe, economical service.

Roebling "Blue Center" Wire Rope has been developed to meet severest service conditions. For a wide variety of tough service applications, it has proved conclusively that it assures lowest general average operating costs.

JOHN A. ROEBLING'S SONS CO., TRENTON, N. J. *Branches in Principal Cities*



ROEBLING ★ BLUE CENTER

GILMER DEFIES SLIPPAGE

Builds V-Belt that Stops Slips



5 FAMOUS FEATURES

of Gilmer V-Belts that save money on multiple drives

1. Top Tension Rubber — Eliminates misfits
2. Rubber-locked Pulling Cords — Patented construction concentrates brute strength in a thin section
3. Heat-resisting Bottom Rubber — Insures cool running at high speeds
4. Double Jacket — Triples the working life of the belt
5. Pre-tested, Controlled Stretch — Guarantees permanently matched working lengths

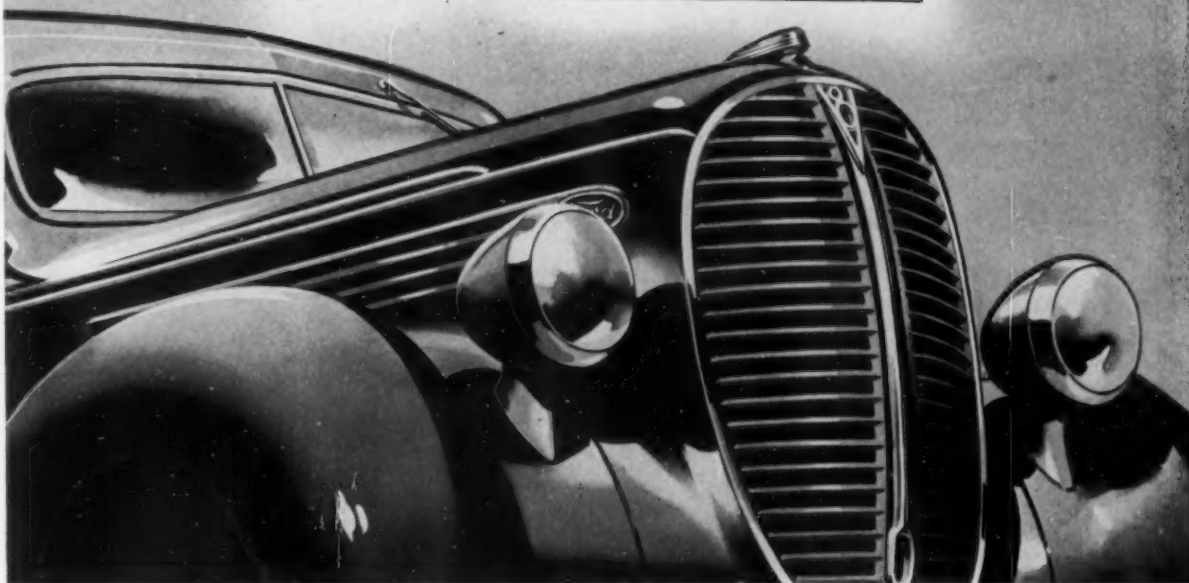
EACH Gilmer V-Belt has *Gilmer grip*. What's Gilmer grip? It's **PULLING POWER**. It's **DEATH TO SLIPPAGE**. It's the grip that locks a Gilmer V-Belt's *straight sides* to the steel sidewalls of the sheave and presses, pushes—*works*. It keeps Gilmers in working position, on the job every working minute.

Get the V-Belt you need in a hurry by going to Gilmer first. Gilmer V-Belts are "tailor-made in the grooves" on the world's largest assortment of V-moulds. Gilmer is always prepared for *your* emergencies.

L. H. GILMER COMPANY, Tacony, Philadelphia
THE OLDEST FIRM OF RUBBER FABRIC BELT SPECIALISTS

FREE— Gilmer Catalogue. Send today.

1938 FORD V-8 TRUCKS



MAKE AN "ON-THE-JOB" TEST WITH YOUR OWN LOADS AND YOUR OWN DRIVER

The showroom is the place to see a truck. But only your own job can prove what it will do for you. There, under your own operating conditions, is the best possible place to discover what you can expect in performance and economy.

Your nearest Ford dealer invites you to try a 1938 Ford V-8 Truck or Commercial Car with your own loads and your own driver. For practically every hauling and delivery need there is a unit that gives the high Ford standard



of dependability and economy. In addition to the new 134-inch and 157-inch wheelbase trucks and the new 112-inch commercial cars, there is an entirely new line of 122-inch one-ton trucks. The new Ford V-8 Trucks have improved braking, easier steering, stronger construction. The new One-Tonners and the Commercial Cars offer a choice of the famous Ford V-8 85 or 60 horsepower engines.

Arrange for an "on-the-job" test today.

FORD'S SEVENTH YEAR OF V-8 SUCCESS

first Among Reduction Crushers

Greater Capacity • Finer Product • Lower Crushing Cost



The predominance of Symons Cones

among plants producing finely crushed materials in quantity, definitely stamps them first in the reduction crusher field. Because of a unique process of crushing, Symons Cones make possible a greater capacity of fine product and at a substantial reduction in crushing cost.

Meet today's demands for finer crushed and better materials with Symons Cones. They will help toward more profitable operation also. There is a size for plants large and small and a type that makes just the kind of product desired. Join with the many who have installed Symons Cones and have solved their reduction crushing problems.

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

New York City
60 E. 42nd St.

Los Angeles
Subway Terminal Bldg.

Toronto
Concourse Bldg.

London
Bush House

SYMONS CONE CRUSHERS

236

STURTEVANT

Air Separators

IN THE CEMENT INDUSTRY



The owners of these Air Separators know that "STURTEVANTS"

Control Particle Size
Control Surface Area
Increase Mill Capacity
Lower Temperatures
Lower Production Costs

These superior results are made possible by the improved design and application based upon research and the practical experience of their many installations.

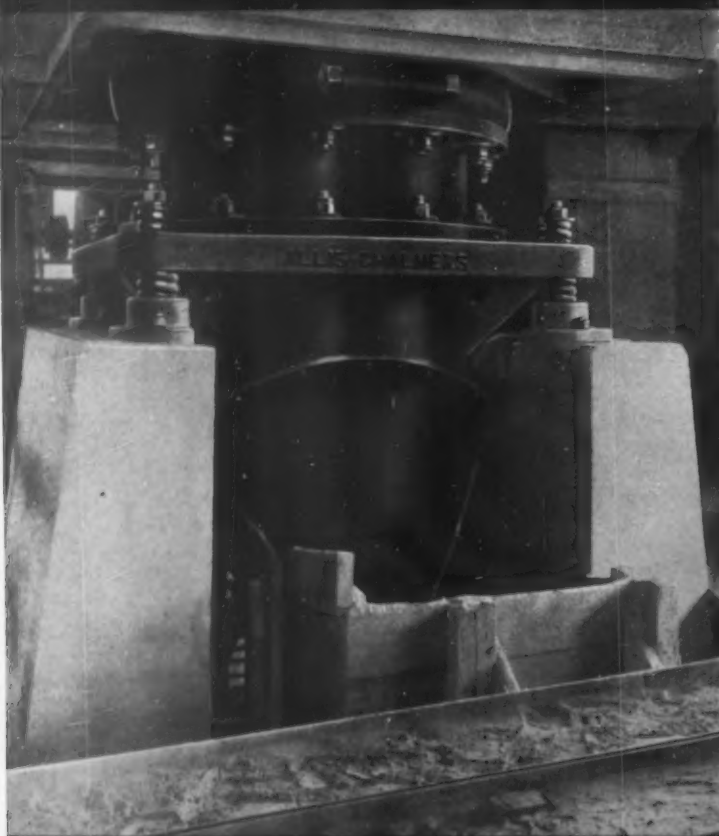
A STURTEVANT AIR SEPARATOR will improve your process from Kilns to Silos. We have made it our business to find the one best method for separating fine material. It resolves itself into

an engineering problem in separator design, placement and application. These plus values are obtained without cost to purchasers of STURTEVANTS.

STURTEVANT MILL CO.
HARRISON SQUARE • BOSTON, MASS.

Flexible

INSTALLATION



EQUIPMENT ENGINEERS TO INDUSTRY

ALLIS-CHALMERS

MILWAUKEE WISCONSIN

THE Newhouse is the one crusher that offers complete flexibility of installation. You can hang it from beams by means of cables or mount it on a concrete foundation with spring support, whichever works best for your plant.

OUTSTANDING FEATURES

1. Minimum number of working parts.
2. No gears and belts.
3. Minimum power requirements.
4. Large unobstructed feed opening.
5. Steep diaphragm, insuring free discharge.
6. Low oil consumption.
7. High ratio of reduction and uniform product.
8. Reversible non-choking concaves.
9. Self-contained with discharge spout, allowing crushed material to be fed direct to elevator or conveyor without additional hopper or chute. For discharging directly into bins or onto conveyor crusher can be supplied with welded steel bottom shell eliminating diaphragm and spout.
10. Large capacity.
11. Low installation cost.
12. Accessibility of moving parts.

816



Outstanding Advantages from BOOM to ENGINE

... Northwest Welded
Shovel Boom and Dipper
Sticks.

... Northwest Alloy Steel
Dragline Boom.

... Northwest Cushion-
Clutch.

... Northwest "feather-
touch" Clutch Control.

... Helical Engine Reduc-
tion Gears. Enclosed and
running in oil.

... Ball or Roller Bearings
on all High Speed Shafts.

... Uniform Pressure
Swing Clutches.

... Northwest Mobility —
power on both crawlers at
all times.

... Northwest Independ-
ent Crowd — simple — di-
rect — powerful.

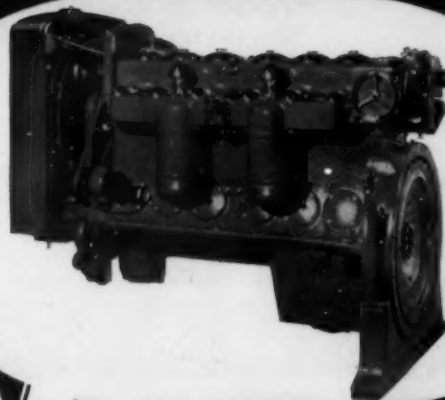
... Northwest simplicity
of design and construction
— low cost upkeep.

**NORTHWEST
ENGINEERING CO.**

1727 Steger Building
28 East Jackson Boulevard
Chicago, Illinois

Built
in a range
of 18 SIZES
3/4 yd. capacity
and
Larger

These two Northwests are powered with
Murphy Diesel Engines.



NORTHWEST

HOW "NITRAMON" SAVES DOLLARS



16,359 LBS. OF "NITRAMON" LOADED
IN TWELVE 9-INCH HOLES, FROM 76
FEET DEPTH TO 93 FEET, TO PRO-
DUCE APPROXIMATELY 55,000
TONS OF STONE.



LOADING TIME 4 HOURS.
NO HEADACHES. NO DANGER OF
PREMATURE EXPLOSION.



A WELL-BALANCED SHOT



ROCK WELL AWAY FROM FACE—
NOT PILED UP HIGH

THE SUPERINTENDENT OF THIS QUARRY SAID:

"We netted an approximate saving of \$120 by using 'Nitramon'.

"The 16,300 pounds of 'Nitramon' did a job that probably
would have required 18,500 pounds of dynamite.

"The estimated cost of 'Nitramon'—Primers and Cordeau . . . \$1,850

"The estimated cost of Dynamite—Cordeau . . . 1,970

"Our net saving was . . . \$120



E. I. DU PONT DE NEMOURS & CO., INC.,
EXPLOSIVES DEPARTMENT, WILMINGTON, DELAWARE

NITRAMON

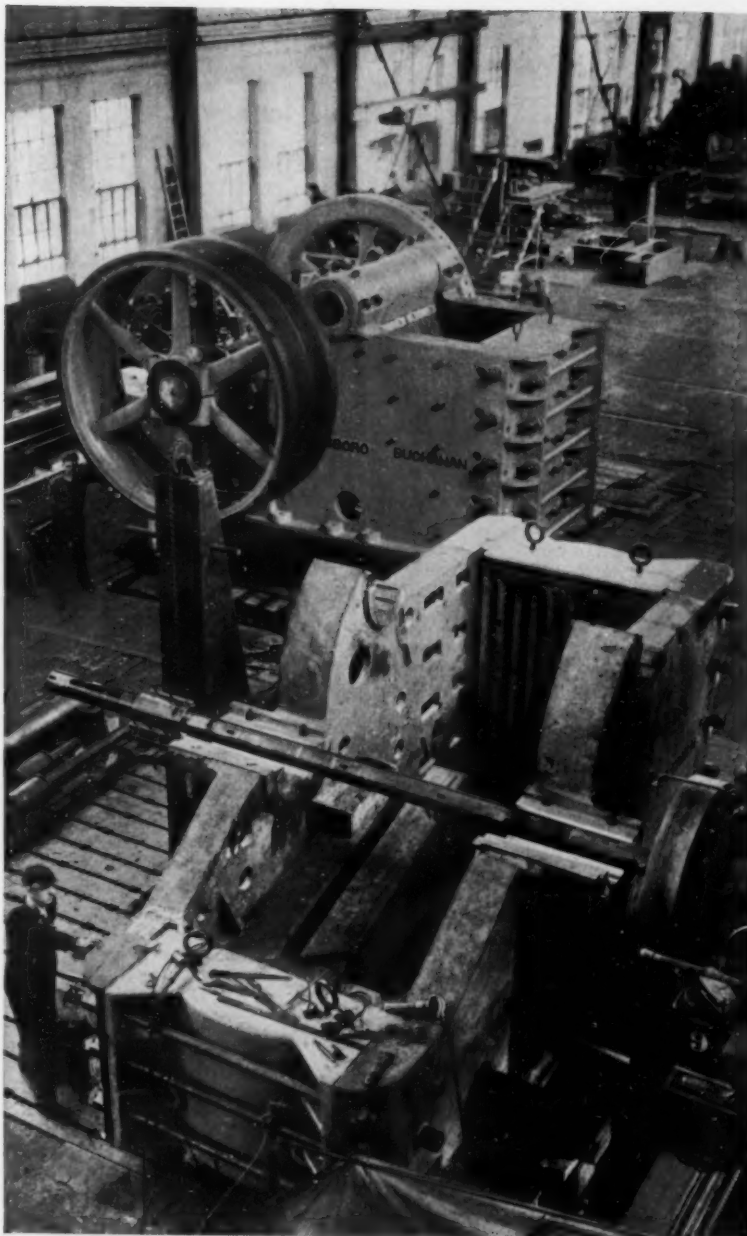
REG. U. S. PAT. OFF.

THE APPROVED BLASTING MATERIAL

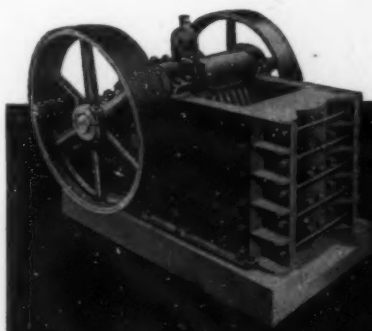
It's all done in our own shops!

DESIGN, PATTERNS, CASTINGS, MACHINING AND ERECTION of Birdsboro-Buchanan Crushers are done completely in our plant. The engineering department, pattern shop and steel foundry work closely together. Our facilities for machining, erecting and testing are modern and capable of handling the largest jaw crushers built (66" by 84"). Our single responsibility for all phases of their manufacture enables us to guarantee every Birdsboro-Buchanan Crusher part.

There is a Birdsboro-Buchanan Crusher to meet your crushing requirements, for every degree of coarseness and fineness. Send for Booklet No. 110—it will bring you the benefit of 30 years' engineering experience in the crushing field. There is no cost or obligation for this Birdsboro-Buchanan service.



*Bearings are line machined
in one single set-up to
insure accurate alignment.*



BIRDSBORO-BUCHANAN

Crushing Machinery Division of

BIRDSBORO STEEL FOUNDRY & MACHINE CO.
90 West Street New York, N. Y.

Represented in Canada by — Fraser & Chalmers of Canada, Ltd.
1411 Crescent St., Montreal, Que. G. E. Sancton, Gen. Mgr.

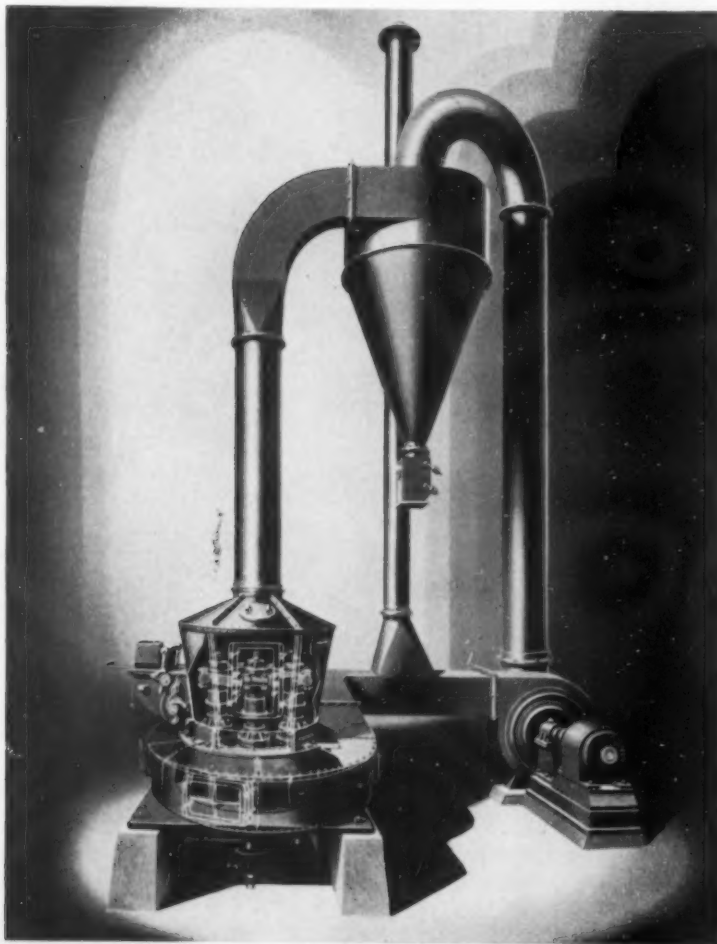
In Choosing Pulverizing Equipment CONSIDER YOUR OPERATING COSTS

Raymond has been building Roller Mills for nearly forty years, and has steadily improved these machines in running efficiency and endurance, until today they are recognized as "Tops" in this class of equipment.

The economy of Raymond Roller Mills is something that cannot be imitated. It is a development of time and experience—a result of advanced features and operating advantages. The Raymond Oil Journals are one of many such improvements that contribute to low power and lubrication costs.

Comparative performance figures on a recent installation for grinding phosphate rock show a gain from 5.35 tons to 6.64 tons per hour, and a reduction from 24.5 KWH to 15.1 KWH in power consumption per ton of material produced—an increase of 24% in output and a saving of 38% in power, due to the use of these modern Oil Journals.

You can rely upon Raymond Roller Mills for maximum return on your investment through their proven operating economies.



If you have a problem in pulverizing, separating or drying any kind of rock products, let Raymond engineers advise you.

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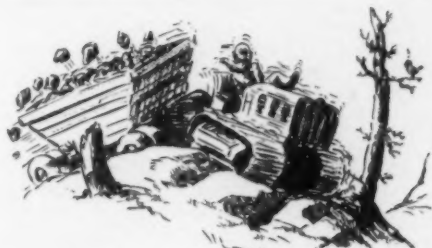
MAR 18 '38

Rock Products

Vol. 41.

Chicago, March, 1938

No. 2



"It Can't Happen Here"— But it does nevertheless

THE TIME is the present. The scene is a rock products operation. The characters are real people although the names are fictitious. The events are actual occurrences.

The Exit company has a contract with a CIO vertical union for closed shop, check-off, full seniority rights, and other features which time will prove are beneficial to neither employer nor employee.

It was decided to add some new equipment—a tractor and earth mover scraper. This provided an opening for a skilled or at least semi-skilled worker. Under union rules and the company's contract with the union, the employee with seniority has first chance to better his job—very fine as an abstract principle.

Joe Senility, holder of seniority rank and rights, had never driven an automobile (believe it or not!), and was ignorant of the difference between a throttle and a piston head; yet Joe wanted the job and by straight seniority rights was entitled to it; and he got it.

The machine was damaged and Joe's life and the lives of some of Joe's comrades were endangered. Joe was persuaded he would be happier in his old job. With considerable relief, doubtless, he returned to it.

But human beings seldom possess humanitarian qualities. They take too much delight in some one else's discomfiture. Jeering (called "ribbing" when it is good natured) is a favorite sport of both children and grown-ups. Joe's comrades ribbed him about being a dumb cluck, etc. And Joe then decided he'd get even with the s— b—s by getting his job back.

So Joe applied to Mike Bumptious, the president of the union local, who was also a common laborer in the plant. Mike's vanity was appealed to, which was not difficult, for Mike was suffering from a severe attack of dilatation of the cranium. Mike insisted on Joe's returning to the job on the tractor.

At this point the Exit company officials might well have taken a bold and determined stand, insisting that Joe had had his chance and had failed to make the grade. But they had experienced one costly strike, and they decided to handle the situation diplomatically.

They said: "Joe is a dumb cluck, Mike; and you know it as well as we do. Now, here's what we'll do, so you can 'save your face.' We'll put Joe back on the job for a few days, and then *you* tell him he is unfitted for it. Again an appeal

to Mike Bumptious' vanity—an extremely effective device with any man, the more so the smaller the calibre of the man—and Mike is not exactly a large calibre.

Now then, if you have followed the story thus far, you know the sequel. Mike Bumptious is really the boss at that operation. The workers, great and small, must kotow to him. Comrade Mike dispenses the favors and the jobs; and don't think he doesn't enjoy it.

But pity the poor workers. Recently employers have been doing their utmost to educate foremen to be fair and just and to eliminate the petty tyrant type. Progress has been made. And for what? Let us pray it is not to make an opening for Comrade Mike and his kind. We have known them all too well these many years in politics; God preserve industry from them!

Experience is an effective teacher—most people believe the only really effective one. American workmen are learning much. It will take time. They suffer Comrade Mikes in politics, because politics touches comparatively few of us very intimately—or at least politics weren't much of a factor in every day affairs prior to WPA. We expect to see Mike and his ilk make their exits, even as the petty tyrant foreman. So have patience, readers.

• • •

EXPERIENCE of the National Bituminous Coal Commission in attempting to fix coal prices, short though it has been, is ample proof that legalized price-fixing is *not* the answer to profitless private industry. All industry can not be arbitrarily disrupted in the hope of solving the problem of one industry only. Even this short experience is enough to show that if the price of one commodity is fixed, the inevitable result must eventually be the fixing of prices on all other commodities and services. The nation (and industry) can not exist "half slave and half free." The Guffey (pronounced Goofy) Coal Control Act, designed "to save coal producers from the results of their own folly" (ROCK PRODUCTS, June, 1937, p. 35) is not saving the National Bituminous Coal Commission from the results of the folly of both coal operators and law makers.

Nathan C. Rockwood



John J. Porter, President
North American Cement Corporation

A Guest Editorial —

Requirements for Recovery

In the Cement Industry

By —

John J. Porter

MY ASSIGNMENT is to discuss the part which the Cement Industry should play in a recovery program, and the coöperation which it should have from and should extend to the Government in that connection. As I see it, this industry would be doing its part if it could bring about the following conditions:

1. Operate at approximately full capacity, and in that way add to the purchasing power of other industries whose products or services it uses. Such other industries are notably: railroads, coal, cotton, paper, power, steel and machinery.
2. Give full employment at good wages, and in that way add to the purchasing power of its employees.
3. Operate efficiently and sell its product at a price reasonable in relation to cost so as not to handicap the users of its product.
4. Make a reasonable profit and pay out a portion of this to investors in the industry to the end that those thrifty persons may have their purchasing and tax-paying power increased.
5. Plow back a portion of profits into plant improvements to the end that builders and machinery manufacturers may have their volume of business and purchasing power increased, and that efficiency of manufacture and quality of product may be further improved.

At the present time we fall far short of this goal. Consumption and sales are about 46 percent of capacity to produce, and dependent industries are, therefore, suffering in their volume and purchasing power. Labor is paid hourly wages above the average of all industry, but continuity of employment and yearly earnings are unsatisfactory. Efficiency of operation is excellent, and price is certainly low in relation to present costs, but profits are, generally speaking, low or non-existent and owners of cement securities greatly restricted in their purchasing and tax-paying power. Finally, with little profit to plow back there is little plant improvement work going on

I will now attempt to analyze the reasons for these lamentable conditions under the headings of Cost, Selling Price and Volume.

Cost

As in most industries, costs are rapidly increasing. In the first place, the price of many materials entering into manufacture has advanced. Notable examples are coal, steel and freight rates on raw materials. The Guffey Act will increase our fuel costs from 2.5c to 5c per barrel and present and prospective freight increases may add another 2c to 4c. Incidentally, it is surprising to what extent freight enters into the cost of manufacturing cement. The amount varies, depending largely on quantity of coal used and distance from coal fields, but in the three plants operated by my company, freight paid on incoming materials is about one-third of the total prime cost of manufacture.

Labor costs have also increased materially. Table I shows the change in hourly rates over a period of years, and it will be noted that present average wages is the highest in the history of

the industry and in the last year alone has increased 17 percent.

There are other factors which have caused labor costs per barrel to increase in even greater proportion than the increase in hourly rates. The practice of giving a week's vacation with pay is now very general, and adds a further percentage to labor cost. The epidemic of labor disturbances throughout the country has resulted in a relaxation of discipline and personal efficiency and this also accounts for some further increase in cost.

Tax increases and new taxes are important factors in increased cost. Social Security taxes approximated 1.5c per barrel in 1937 and will be about 2.0c per barrel in 1938.

One of the chief cost difficulties of the Cement Industry lies in the effect of low volume on capital charges. Census reports show that cement manufacture requires a much greater investment per unit value of production than most other industries and that being the case, fixed charges are necessarily high and are affected to an abnormal extent by falling off in volume. To illustrate, the cost of a cement plant may run between \$2.00 and \$3.00 per barrel of annual capacity, depending on site and raw materials, railroad connections, whether or not housing facilities must be provided, whether power is purchased or generated, and other factors. Working capital must also be provided and should be about 50c per barrel of annual capacity. The average necessary investment, therefore, will be about \$3.00 per barrel. Depreciation at 5 percent on \$2.50 amounts to 12.5c, interest at 6 percent on \$3.00 is 18c, a total of 30.5c per barrel fixed charges when the plant is selling its full capacity. Under present conditions, with industry operating at 46 percent capacity, these fixed charges are automatically increased to 66c a barrel.

TABLE I—AVERAGE WAGE PAID PER MAN HOUR

	Average of Reporting Plants in United States U. S. Bureau of Labor Statistics	Average for Year North American Cement Corp. 3 Cement Plants
1926	not available	.482 approx.
1927	"	.500 "
1928	"	.507 "
1929	"	.533 "
1930	"	.551 "
1931	"	.495 "
1932	.441	.439
1933	.467	.507
1934	.562	.555
1935	.572	.560
1936	.579	.604
1937	.674*	.695

*Month of August.

In 1932, when the Industry got down to 28 percent operation, fixed charges on this assumed basis would have been \$1.09 per bbl.

In addition to these capital charges, taxes, insurance, general administrative costs and selling expenses are all items which are relatively fixed in amount and which therefore increase very rapidly per barrel as volume decreases. It is because of this very important effect of fixed charges on cost that competition becomes so exceedingly keen when volume drops off. Obviously, any company which does not get a satisfactory proportion of the going business is placed at a tremendous cost handicap and any company that can increase its normal proportion, has a tremendous advantage. This is the fundamental condition which is responsible for our high selling expenses as well as for the price wars which have from time to time plagued the industry.

Selling Price

The Cement Industry has been repeatedly accused of price-fixing and profiteering. Recently it has been publicly named as one of those industries which have helped to destroy prosperity by raising prices. To those familiar with the facts, the accusation would be humorous if it were not so tragic. As to the facts, these are best shown by the following table taken from the U. S. Bureau of Mines' statistics:

TABLE II—AVERAGE NET BULK MILL PRICE RECEIVED BY CEMENT MANUFACTURERS IN UNITED STATES (Bureau of Mines)

1920.....	\$2.02	1929.....	\$1.48
1921.....	1.80	1930.....	1.44
1922.....	1.76	1931.....	1.11
1923.....	1.90	1932.....	1.01
1924.....	1.81	1933.....	1.33
1925.....	1.77	1934.....	1.54
1926.....	1.71	1935.....	1.51
1927.....	1.62	1936.....	1.51
1928.....	1.57	1937.....	1.50*

*First 9 months.

It will be noted that recent prices in the industry are considerably below those prevailing in 1926, and have not on the average increased during the past three years. The exceedingly low prices of 1931 and 1932 were caused by the price war of that period.

However, this is not the whole story. There is a large section of the country which has been affected by foreign competition and in which there has been a drastic decline in prices during the same period in which costs have so greatly advanced. The figures in Table III show this situation.

All industries lost volume during the depression, but few had as calamitous an experience as cement which, at the bottom, was off to about 28 percent of capacity and about 36 percent of the maximum actual production reached in 1928. As previously pointed out, reduction in

TABLE III—AVERAGE NET BULK MILL PRICE RECEIVED BY CEMENT MANUFACTURERS IN DISTRICTS 1 AND 2 (NEW YORK AND NEW ENGLAND AND MIDDLE ATLANTIC STATES) (Bureau of Mines)

	District 1	District 2
1920	\$1.93	\$2.02
1921	1.78	1.88
1922	1.63	1.73
1923	1.81	1.87
1924	1.72	1.81
1925	1.74	1.75
1926	1.71	1.74
1927	1.55	1.56
1928	1.52	1.53
1929	1.41	1.46
1930	1.39	1.52
1931	1.00	1.00
1932	.99	1.07
1933	1.27	1.35
1934	1.50	1.60
1935	1.46	1.57
1936	1.51	1.57
1937*	1.39	1.47

*First 9 months.

volume is also more serious in this industry because of its relatively high capital charges.

It is interesting to trace the sources of this loss in volume and, while the statistical data available are not all expressed in the same units and to some extent overlap causing inaccuracies, the following figures will answer our purpose. Note that Privately Financed Large Projects showed the greatest falling off at the peak of the depression, and that Highways have shown the smallest recovery. The greatest opportunity for recovery in the construction field is evidently in these two classifications.

It now remains to suggest how Industry and Government can help in overcoming present handicaps in order that cement manufacture may contribute its full measure to the prosperity of the country.

First, as to Industry

Because most forms of coöperation are forbidden under the American competitive theory, there is little that the cement industry can do as an industry. There is, however, one method of coöperation which is open and which is very much in the public interest, namely,

association in research and promotional work looking toward wider and more efficient use of our product. The Portland Cement Association is the medium through which these activities are now conducted, and it is supported by a large majority, although unfortunately not by all manufacturers of cement. This organization conducts research in its own laboratories and in co-operation with the Federal Bureau of Standards. Its investigations into the chemistry of cement have resulted in greatly improved quality in the past and give promise of equally great improvements in the future. Its researches on concrete have tremendously increased the strength and durability of this material, and it has been largely responsible for the commercial development of concrete roads, concrete bridges, architectural concrete, concrete residences and many other new and interesting uses of cement, all of which contribute increased volume of business to the Cement Industry and improved standards of living to society. If this work were more generously and unanimously supported, it could do much to help recovery.

Industrial managers generally should have a greater sense of social responsibility. There has been a tremendous improvement in this respect during the past few decades and I think the rate of improvement has been accelerated during the last few years. Nevertheless, there is still much progress to be made and we should look forward to new ideals rather than emphasize with smug satisfaction our past attainments. If I read correctly the signs of the times, it is impatience with this latter attitude which gives rise to much of the present criticism against business. The highest standards of social and moral ethics are not too high a plane on which to conduct business, and management should have always in the forefront of their minds the consequences of their decisions on the welfare of the public and their employees.

Also, cement manufacturers, in common with all industry, should fully recognize the responsibility of management

TABLE IV

	Privately Financed Small Projects (Index used, North American Cement Corp. Trade Orders)	Privately Financed Large Projects (Index used, Dodge Reports)	Publicly Financed General Construction (Index used, Dodge Reports)	Publicly Financed Roads and Pavements (Index used, Portland Cement Ass'n Reports)
Average 4 years 1926-1929 taken as 100%				
1930	48.8%	60.8%	109.1%	112.0%
1931	61.9	31.6	84.5	103.7
1932	41.4	14.7	43.2	74.4
1933	28.4	17.6	24.9	34.6
1934	48.7	19.1	36.3	34.6
1935	52.8	23.5	54.9	33.4
1936	71.9	40.1	79.3	43.4
1937*	85.7	50.4	69.9	44.2

*Partly estimated.

for the welfare of employees. Social evolution has gone past the idea that labor is a commodity to be bought without regard to human needs, and we now are headed towards a new conception; that management is trustee for both capital and labor and should be held equally responsible for the welfare of both.

In my opinion, recent labor disturbances have been largely due to the fact that labor has been given so much power so quickly and has not fully learned that power brings responsibilities. There are, however, indications that the lesson is being absorbed rapidly. It is not necessarily a calamity to have to deal with a union, but much depends on the sense of responsibility and the knowledge of economic and business conditions on the part of those charged with its leadership. There is, therefore, great need for the education of our workmen, and sincere efforts to spread information (not propaganda) will go a long way towards curing labor problems and overcoming one contributing factor to the depression. A generation ago the policy of secrecy in corporation affairs was general, and in many cases management refused information even to those who furnished the capital on which the business operated. This condition no longer holds, but there are still managers who feel that the affairs of the corporation are not of interest or are none of the business of the workers who are dependent on it for their livelihood. I think this attitude is also a mistake, and I believe employees should be given full information to enable them to judge as to the security of their jobs and what it is reasonable to expect their employer to do for them.

Second, as to Government

It is obvious that the greatest need of the Cement Industry and those depending on it, is volume. Volume of production can come only from increased sales. Increased sales for the industry (as distinguished from individual companies) can come only from increased consumption of cement, and this in turn will come only through increased confidence on the part of consumers, in other words, the great American public. Cement goes into construction. Construction, whether a residence, sidewalk, factory, or road, is a long-term investment. People are unwilling to make long-term investments unless they feel reasonably secure as to the future. Consequently, anything that the Government can do to restore confidence, to promote stability, and to eliminate uncertainties will do more than anything else to restore prosperity to the Cement Industry. In this respect our problems are identical with those of all industry, and I think no better program could be devised for bringing about this happy state of affairs than that set

forth in the statement of principles which was recently circulated in Congress. These principles and objectives, as reported in the press, are as follows:

1. Immediate and thorough revision of the capital-gains tax and the undistributed profits tax.
2. Steady approach to a balanced budget through reduced expenditures.
3. An end of coercion and violence by either labor or capital in labor relationship, with the government remaining impartial and intervening only as a last resort.
4. An end of governmental competition with private enterprise and instead, encouragement to legitimate institutions assisting the flow of private funds into investment.
5. Recognition of the right of reasonable profits and the maintenance of competition as against private or governmental monopoly.
6. Security for legitimate industry as the basis of maintaining values.
7. Reduction of the tax burden.
8. Maintenance of state rights and local self-government.
9. Non-political, economical, relief for the needy with county, city and state responsibility emphasized.
10. Reliance upon private enterprise and initiative, self-reliance and ambition.

The Cement Industry is seriously affected by the economic inconsistency of a policy of inflated costs as carried out under the NRA, the Wagner Labor Relations Act, Guffey Coal Act, etc., and a tariff policy which throws our seaboard markets wide open to the cut-throat competition of European nations operating on a deflated cost basis. American managers and workmen are not lacking in efficiency but they cannot overcome the handicap imposed by lower standards of living of European competitors as indicated by the following wage data. These data which are the latest available to me are taken from a letter written on April 24, 1936, by Mr. Blaine S. Smith, at that time president of the Pennsylvania Dixie Cement Corp., to Senator Burton K. Wheeler and made a part of the record on Senate Bill 4055.

Average wage per hour paid to cement workers:

United States....	57.4c
Belgium	10.5c
Denmark	24.0c
Germany	15.5c
Russia	16.4c
Japan	7.0c

Another of our difficulties is the criticism to which we are subjected for advancing our prices while at the same time the Government is helping certain favored industries such as railroads and coal to increase their prices, thereby increasing our costs. I have already

pointed out that cement prices generally have not recently been advanced which makes our plight all the worse.

Personally, I do not think there is a great deal that the Government can do in the way of direct aid. The much publicized Housing Program will no doubt help somewhat, and to the extent that it aims at slum clearance and better housing for the underprivileged, its social objective is worthy. I do not, however, think it will have any large effect in restoring prosperity to the cement or construction industries. The volume of business it will produce is overestimated and it will be slow in getting under way.

On the other hand, Federal and State highway programs do have a vital bearing on prosperity since there has been the least recovery in this branch of construction. It is important to note that highways can be built without affecting the balancing of budgets and in that way disturbing confidence. Users of highways stand ready to pay for their improvement; all that is needed is that gasoline taxes collected as tolls be used exclusively for their construction and maintenance. The sum total of gasoline taxes now collected would be sufficient to immediately restore highway building to pre-depression levels, and such action would go a long way towards putting the Cement Industry and several other branches of construction as well as employment generally on a pre-depression basis.

There are other reasons why this diversion of gasoline taxes should be stopped. First is the unfairness of assessing a special sales tax on highway users for the benefit of the general budget. Another reason is the congested condition of present highways. The registration of automobiles has increased out of all proportion to the improvement of the main roads on which these cars must travel, and any State Highway Department can furnish evidence as to the inadequacy of these traffic arteries.

Most important of all is the butchery of American citizens in highway accidents, most of them directly due to the inadequacy of the highways themselves. Forty thousand people, approximately one in every three thousand of our population, lost their lives in automobile accidents in 1937, and competent engineers estimate that more than half of these lives could have been saved if our highways were modernized with divided traffic lanes and other improvements. Here is an opportunity for state and national governments to do a real job in the interest of both industrial prosperity and common humanity.

In conclusion, I suggest that the great need not only of this country, but of the whole world, is an attitude of tolerance. The Golden Rule is still our best guide to peace and prosperity.

Record Attendance at Sand and Gravel Convention

BUSINESS CONDITIONS REVIEWED

ATENDANCE at the twenty-second annual convention of the National Sand and Gravel Association and the eighth annual convention of the National Ready-Mixed Concrete Association, held concurrently at Cincinnati, Ohio, January 31 to February 3, inclusive, was the largest in the history of the associations, numbering close to 600. The two groups met jointly to discuss problems of common interest and held separate sessions for the treatment of topics peculiar to each industry.

Machinery Exhibits

In connection with the conventions, a machinery exposition was held which filled all available space in the exhibition hall. Close coöperation between officials of the two associations and those of the Manufacturers' Division was instrumental in bringing to the convention one of the most complete displays ever held at the conventions. The character of the exhibits was proof that much development is in progress to make more efficient, all types of machinery used by the industries. Programs were so arranged that ample time was given over to inspection of the exhibits.

Many of the displays were continued over from the convention of the National Crushed Stone Association held the previous week. A contest, similar to the one held the week before, was conducted in the booth of the Cross Engineering Co., Carbondale, Penn., to determine the winner of an outdoor chair made from perforated plate. J. H. Adams, The Sturm and Dillard Co., Circleville, Ohio, was the winner. In the booth of the Lima Locomotive Works, Inc., Lima, Ohio, a contest was continued for the selection of the best name for a new $\frac{3}{4}$ -cu. yd. shovel recently placed on the market. The winner of the \$100 cash prize will be announced at a later date.

Although there was much business to be transacted, entertainment was not overlooked. The formal opening of the machinery and equipment exposition was preceded by a buffet supper. Ladies in attendance had a special entertainment program arranged for their benefit.

At the annual dinner, sponsored by the two associations, an evening of first class entertainment was provided.

In addition to an elaborate floor show, an orchestra was on hand for dancing. At the banquet, J. L. Shiely presented the trophies awarded by Rock Prod-



J. Rutledge Hill, new president of National Sand and Gravel Association

ucts to the winners of the annual safety contest of the National Sand and Gravel Association for 1936. One of the trophies was presented to F. D. Coppock, American Aggregates Corp., for the plant having the best safety record with over 100,000 man-hours operation. This was for the record established by the Oxford-Fuller, Mich., plant. Robert Mitchell, Consolidated Rock Products Corp., Los Angeles, Calif., received the trophy awarded to its Orange No. 14 plant for the best safety record for plants with less than 100,000 man-hours of operation.

Officers Elected

J. Rutledge Hill, Gifford-Hill and Co., Inc., Dallas, Texas, was elected president of the National Sand and Gravel Association to succeed Alexander Foster, Jr. Paul P. Bird, Boston Sand and Gravel Co., Boston, Mass., was elected vice-president and H. S. Davison, J. K. Davison and Bro., Pittsburgh, Penn., was chosen secretary-treasurer. C. M. Cadman, Pacific Coast Aggregates, Inc., San Francisco, Calif., M. A. Neville, Western Indiana Gravel Co., Lafayette, Ind., G. W. Renwick, Chicago Gravel Co., Chicago, Ill., and J. M. Settle, Ohio River Sand Co., Louisville, Ky., with the officers comprise the executive committee.

J. F. Berger, John A. Roebling's Sons Co., Trenton, N. J., was elected chair-

man of the Manufacturers Division, National Sand and Gravel Association, at a luncheon meeting. Vice-chairmen are Delbert Kay, Nordberg Manufacturing Co., Milwaukee, Wis.; Arthur A. Levison, Blaw-Knox Co., Pittsburgh, Penn.; F. E. Finch, Hardinge Co., York, Penn.; M. S. Lambert, Robins Conveying Belt Co., Chicago, Ill.; Bruce G. Sholton, Hendrick Manufacturing Co., Pittsburgh, Penn.; L. W. Shugg, General Electric Co., Schenectady, N. Y.

The convention was formally opened at a joint session of the two associations with an address of welcome by Mayor James G. Stewart of Cincinnati, followed by the annual addresses of the presidents of the associations.

Private Construction

B. L. Johnson, editor, *American Builder and Building Age*, in his paper, "What Industry and Government Can Do to Stimulate Private Construction," discussed the prospects of all types of construction, reviewed what has been done by various governmental agencies and offered his opinion of what may be expected to come.

Mr. Johnson said that despite the setback late in 1937, the year ended with very satisfactory results from the standpoint of construction. The total for all construction projects in the United States for 1937 was given as about \$3,190,000,000. As compared with the previous year, figures showed a 15 percent increase in residential building, a 21 percent increase in non-residential building and a 40 percent increase in public utility construction with a drop of 20 percent in public works.

Mr. Johnson believes that the attitude of the federal government is favorable toward construction and that there has been a desire on its part to be helpful. He quoted figures recently received from the Bureau of Labor Statistics summarizing purchases made by the government from the beginning of the fight against the depression up to September, 1937. Among them were listed purchases of portland cement totaling \$310,000,000, concrete products \$91,000,000, \$101,000,000 for crushed stone and \$132,000,000 for sand and gravel.

Mr. Johnson discussed the financing of construction to considerable length and the functions of the Federal Housing Administration. He believes that

Sand and Gravel—Ready-Mixed Concrete Associations



A characteristic picture of J. Rutledge Hill, Dallas, Tex.



From a far-away part of Texas came J. A. Buechler, Corpus Christi



A huddle on ready-mixed concrete from left to right, Alex. Foster, Jr., Irving Warner, Philadelphia, Penn., Lion Gardiner, Columbus, O., and Paul P. Bird, Boston, Mass.



Convention hall set up for National Sand and Gravel Association Meeting



Alex. W. Dann, Pittsburgh, Penn., past president National Sand and Gravel Association, lights up the old "base burner"



Paul Graham, Long Beach, Calif., studies a machinery model



H. F. Thomson, St. Louis, Mo., figures out a problem in ready-mixed concrete



James F. McCracken, Louisville, Ky., newly elected president of the National Ready-Mixed Concrete Association



Mrs. Eva S. Crowe, East Chicago, Ind., is presented with a bouquet of roses and a wrist watch "for extraordinary services rendered the ready-mixed concrete industry"



Col. John M. Settle, Louisville, Ky., well-beloved "old-timer"



Mrs. Grace Sharp, better known as Miss "Mac," efficient secretary of Executive Secretary Ahearn of the National Sand and Gravel Association



Claude L. Clark, secretary, Ohio Sand and Gravel Association



Roy V. Warren, secretary, Western Pennsylvania Sand & Gravel Association



Joe L. Shiely, St. Paul, Minn., leads the congregational singing



Herbert Jahncke, New Orleans, son of Walter Jahncke



Harry A. Stelley, Buffalo, N. Y.



J. F. Berger, elected Chairman of the Manufacturers' Division, N. S. & G. A.



Thoughtful Stephen Stephanian, Columbus, Ohio



Norman G. Hough, Cleveland, Ohio, and J. M. Gager, Chattanooga, Tenn., in a huddle



P. W. Gifford, talking over the situation

National Crushed Stone Association Convention



W. M. (Bill) Andrews, New Castle, Penn., is host as usual



Fred O. Earnshaw, Youngstown, Ohio



Set up of convention hall for National Crushed Stone Association



A. G. Seitz, Easton, Penn., one of the crushed stone industry's ace operating men



J. H. Jackson, Youngstown, Ohio, tells a story



J. A. Rigg, Fort Spring, W. Va., a vice-president of the National Crushed Stone Association



Left to right, E. A. Heise, Columbia, Ill., and M. M. Bales, Elmhurst, Ill.



Col. L. J. Boxley, Roanoke, Va., the F. F. V.'s contribution to the Crushed Stone board of directors, studies ROCK PRODUCTS



E. P. Attwood, Quincy, Mass., who was making crushed stone when many present were born



National Crushed Stone Association Directors deliberate; Al Worthen, past-president in foreground



Mrs. Fred Earnshaw, Youngstown, Ohio, a regular attendant for many years of Crushed Stone Conventions



Theodore (Ted) C. Cooke, Swampscott, Mass., is one of the coming younger producers



Henry E. Rhodes, well-beloved, retiring president of the N. C. S. A., in a contemplative mood



T. I. (Ike) Weston, new President of the National Crushed Stone Association, poses for his picture



Character study of Jim Savage, Buffalo, N. Y., a director of the National Crushed Stone Association since its birth



Otho M. Graves, past president, National Crushed Stone Association, enjoys the show

the charter under which FFA has been operating is going to be extended and liberalized still further and that the granting of 90 percent loans will stimulate building. He said that building materials have been greatly improved in recent years and that substantial values can be had per dollar by building today.

Ray S. Smethurst, Associate Counsel of the National Association of Manufacturers, discussed at length policies and happenings in Washington, with particular emphasis on measures that have direct bearing on the sand and gravel industry.

Forum on Business Conditions

A most interesting part of the convention was the report of business conditions throughout the country. Speakers from all regions of the United States submitted their replies to pre-assigned questions on conditions vitally affecting the sand and gravel industry. Summarizing the reports, there were wide variations in the volume of business for the year 1937 with considerable conjecture as to what will take place in 1938.

Paul P. Bird, Boston, Mass., in reporting for the New England States, said that the volume of business done in 1937 exceeded that of 1936 by 12 percent and predicted a decrease of about 20 percent for 1938. The price level in 1937 was about the same as in 1936, with the sand and gravel plants operating to about 50 percent of capacity.

Of the total production, 35 percent went into the construction of highways and streets, 35 percent for publicly financed structures and 30 percent for structures financed by private enterprise. This proportion of privately financed work, 30 percent, is again predicted for 1938.

The public works program in New England depended heavily on emergency federal appropriations. This area in normal years depends largely upon privately financed projects.

R. C. Collins, Warner Co., Philadelphia, Penn., reported for an area embracing Trenton, N. J., Philadelphia, Penn., and Wilmington, Del. Sales of sand and gravel increased 8.6 percent in 1937, including carload shipments from plants and truck load sales in Philadelphia. A decrease of from 10 to 20 percent in sales is predicted for 1938, based on anticipated legislation.

Prices increased from 3 to 10 percent in 1937 and will fall 5 or 10 percent in 1938, said Mr. Collins. Production was 30 to 40 percent of normal volume, based on the volume produced in the years from 1921 to 1930. From 75 to 80 percent of the tonnage was



Safety Trophies Awarded at National Sand and Gravel Association convention. Left—Trophy awarded to American Aggregates Corp., Oxford-Fuller, Mich., plant for best record of plants operating over 100,000 man-hours. Right—Trophy awarded to Consolidated Rock Products Corp., Los Angeles, Calif., for the best safety record of plants operating less than 100,000 man-hours.

for public or semi-public work. Street pavement and highway construction are looked to for the major portion of the 1938 tonnage. Privately financed work should account for 30 to 40 percent of the 1938 volume. In 1937 more than 50 percent of the tonnage went for public works. In this area, private construction is normally not depended upon for the largest tonnage.

For Western New York, E. J. Nunan, Buffalo Slag Co., Buffalo, reported a volume increase of one-third for 1937 and predicted a sharp decline for 1938. The price level in 1937 was maintained at the 1936 level and an increase in 1938 is not expected. During the year the demand for sand and gravel in the Niagara Frontier section of the territory at times closely approached plant capacity while the general average for the region was nearer 50 percent of capacity. About 50 percent of the projects were publicly financed. Sewer systems and disposal plants as well as highways and streets accounted for a substantial part of the tonnage, with practically no railroad ballast. Publicly financed projects are nearing completion, so unless new ones are started a marked drop in the percentage of this class of work is anticipated in 1938.

Ray V. Warren, Pittsburgh, Penn., reported an increase in sales volume of two percent for 25 counties in Western Pennsylvania and forecast an equal volume for 1938. The price level rose slightly due to increases on April 1, although the full benefit of the price increase has not yet been felt because many commitments were at the old public work. The consensus of opinion

price. A slightly better price is hoped for in 1938. Volume of demand was about 50 percent of capacity. The steel companies in their revamping programs took considerable sand but used their own flux stone in place of gravel.

Pavements took considerable tonnage and the public highway program now getting under way is expected to offset some curtailment in industrial work. The public works program had some dependence in 1937 on both WPA and PWA. Greatest aid came from the federal highway program. In 1938 producers are expected to benefit considerably from WPA grants to the state authority. An extensive project for institutional building by the state authority through grants of PWA is now getting under way. In normal years, privately financed projects take the bulk of production, but producers are going to depend largely on the housing program and publicly financed county structures, said Mr. Warren.

Business conditions in Ohio were reported by Stephen Stepanian, The Arrow Sand and Gravel Co., Columbus, Ohio, based on replies to a questionnaire mailed to 75 members of the Ohio Sand and Gravel Association. Volume of business in Ohio decreased about 10 percent in 1937 and a definite decrease is predicted in 1938. The price level remained the same and is expected to continue. Volume of demand to capacity was 60 percent and most of the tonnage was used for highway construction and public building. About 70 percent of the output went into

is that sales will be similarly proportioned in 1938. About 40 percent of the public works program in 1937 depended upon federal emergency appropriations. Reasons for the decline in business late in 1937 were attributed to the actions of the federal government.

A. J. O'Connor, Koenig Coal and Supply Co., Detroit, Mich., reported on conditions in the Detroit area, based on the rail producers and not including "wayside plants." Sand and gravel volume of business increased 25 percent in 1937 with higher prices. A decline in volume is expected in 1938 at substantially the same prices in 1937. Demand was about 60 percent of capacity and the largest outlet was for public structures. About 75 percent of the shipments was for public works, and this source is again looked to for the greatest volume in 1938. Mr. O'Connor could give no accurate prediction as to prospects in 1938.

V. P. Ahearn read the report of H. N. Battjes, Grand Rapids Gravel Co., Grand Rapids, Mich. For 1937, this company had a decline in volume of business of 20 percent and a decrease in price of 10 percent. A pickup in business is expected along about midsummer with a further decline in prices. The volume of demand was 50 percent of capacity. Highways and streets took 45 percent of the output, railroad ballast 21 percent, housing construction 32 percent and large industrial structures 2 percent. Public works represented 50 percent of the market. Private construction is expected to increase in 1938. About 25 percent of the highway work was financed by emergency money in 1937.

In Northern Illinois, tonnage dropped off 25 to 30 percent, said R. E. Weaver, Lincoln Sand and Gravel Co., Lincoln, Ill., reading the report of O. J. Ellingen. A further decrease of 25 percent is expected in 1938 with about the same prices as in 1936 and 1937. Volume of demand was less than 50 percent of capacity. The distribution was 58 percent for highways and streets, 5 percent for large industrial structures, 8 percent for housing construction, 9 percent for public buildings, dams and bridges and 20 percent for railroad ballast. It was predicted that public works will consume 70 percent of the demand in 1938, while in normal years privately financed projects took 40 percent of the production.

For the St. Louis area and vicinity, H. P. Thomson, General Material Co., St. Louis, Mo., said there had been a 15 percent increase in volume in 1937, with prospects for a decline in 1938. The year 1938 is expected to start out slowly with an improvement later in the year. An increase in the price level for sand and gravel was effective during

the summer of 1937 and is being maintained for gravel. Volume of demand was 50 percent of capacity, and in 1938 the principal demand is expected from private financing. Expenditures for public works in 1937 depended largely upon emergency federal appropriations, which expenditures will decrease in 1938.

V. P. Ahearn, reading the report of H. P. Caldwell, Louisville, Ky., said that there had been a slight decrease in tonnage with prospects of little change in 1938. Prices remained the same as in 1936 but were more stabilized. Demand was about 50 percent of capacity and consisted largely of public construction. It is expected that highways, streets and public structures will take two-thirds of the 1938 production. The 1937 public works program depended almost entirely upon federal emergency appropriations.

For Southeastern Tennessee, Northeast Alabama and Northwest Georgia, W. J. Brown, Chattanooga, Tenn., said there was a 25 percent decrease in volume with prospects for the same volume for 1938. The 1937 price level was slightly higher than in 1936 with favorable prospects for 1938. The 1937 volume represented 25 percent of capacity. Tonnage consisted of 25 to 50 percent for bridge and paving contracts, 15 to 25 percent for PWA and WPA projects, 15 to 25 percent for industrial structures and a small amount for railroad ballast. The ratio of public works to private projects was three to one.

P. W. Gifford, Gifford-Hill Co., Inc., Dallas, Texas, reported a decrease in volume of 20 percent for Texas and the west and north half of Louisiana. The decline was attributed to the almost complete loss of railroad ballast and the close of highway construction in Louisiana. The same volume of business is expected for the first six months of 1938. Prices were 10 percent lower due mainly to competition of local pits. Volume of demand was estimated at 40 percent of capacity and 80 percent of it went into public works construction. This public works program depended on federal emergency appropriation to the extent of 20 percent.

H. G. Jahncke, Jahncke Service, Inc., New Orleans, La., reported a volume increase of one-third in New Orleans with prospects for a further increase in 1938. The price level was the same as that in 1937 and should continue in 1938. Half the plant capacity was required to fill orders. Highways and streets produced the greatest demand, which was 50 percent for public works. This figure will likely increase to 75 percent in 1938.

The Lower Missouri Valley had a volume in 1937 equal to that of 1936, said John Prince, Stewart Sand and Mate-

rial Co., Kansas City, Mo., and will have a probable decline of 20 percent in 1938. Prices have remained the same but are increasing due to taxes and increased labor rates.

J. L. Shiely, St. Paul, Minn., reported conditions to be about the same as the average of the preceding reports. No long range planning is being done due to the indefiniteness of the government's program. Sand and gravel volume was 70 percent of that in 1936 and a further decrease was forecast for 1938. The price level increased 10 percent and is expected to drop in 1938. The demand was for 30 percent of capacity, public works taking about 80 percent of the production. In 1938, the reverse is expected with a volume of 75 percent for privately financed projects.

H. F. G. Pelsue, Los Angeles, Calif., reported commercial production in his area to be higher in 1937 than in 1936, with an expected decrease in 1938. Public works took 60 percent of the total volume, which is expected to decrease in 1938.

V. P. Ahearn read the report of F. P. Spratlen, Jr., Denver, Colo. Volume of business in this region decreased 25 percent in 1937, and there are indications of a further reduction in 1938. The price level was slightly lower and the demand was one-third of capacity. Large public structures, highways and streets and large industrial structures produced the greatest demand, with about 75 percent of the projects publicly financed. Labor unrest was blamed for the decrease in business in 1937.

In the San Francisco area, according to the report of C. M. Cadman, San Francisco 1937 business increased 15 percent in volume with price levels the same as in 1936. Lower prices and the same volume are anticipated in 1938. Demand was for 40 percent of plant capacity of which 50 percent was used for publicly financed projects.

Summarizing the Reports

Executive Secretary V. P. Ahearn concluded the forum on business conditions by summarizing and incorporating the various reports into one to represent the country as a whole. His impression was that the volume of business in 1937 equalled that of 1936. As for 1938 a decline of 15 to 20 percent is to be expected for the first six months, with an increase later in the year. The general opinion is that a business revival is looked for late in 1938.

In the 1925 to 1929 period, with an annual construction volume totaling \$12,000,000,000, \$9,000,000,000 came from privately financed projects, said Mr. Ahearn. Since 1930, this relation

has been changed and public works now dominate the construction volume. He said that a real recovery in the construction industry cannot be realized until there is a revival of private building and a decline in federal participation in public works.

Summarizing further, the consensus of opinion, based upon reports, was that the price level in 1937 was about the same as in 1936. A slight decline in prices will probably hold early in 1938, assuming a decline in volume. Volume of demand over the country averaged probably 50 percent of capacity, with some plants operating as little as 25 percent.

Mr. Ahearn expressed some alarm that publicly financed projects continue to be the principal responsibilities of the industry and that demands for 1938 will again be dependent upon public funds. In his opinion, just so long as the states continue to look to the federal government for financing the public works program, then just so long will serious diversion of highway funds continue. He estimated that about \$800,000,000 of highway funds were diverted in the last six years. In commenting further, Mr. Ahearn said that practically every speaker reported a tremendous accumulation of demand for private construction.

Report of the Director of Engineering

Activities of the Engineering Division of the National Sand and Gravel Association were briefly summarized by Stanton Walker, Director of Engineering, who commented also on the history, objectives and needs of the Division.

From its beginning 12 years ago the Engineering Division has directed its efforts along five major lines, said Mr. Walker. These subdivisions are the conduct of research, coöperation with technical societies, the preparation of technical publications useful to producers and users of aggregates, consulting services to member companies and users of sand and gravel and the representation of member companies, or the industry, on engineering questions before various groups.

In commenting on work being done along these lines, Mr. Walker pointed out that the Association is represented in practically all technical societies of national importance which concern sand and gravel and that it is a participant in the committee work of such groups. He discussed briefly technical information which has been published and distributed, important researches in progress and commented upon the consulting work being done.

The desirability of working toward a condition where relatively long-range

planning is possible was emphasized and Mr. Walker told the members what additional help is needed in order to more effectively carry out needed work. His report concluded with a review of his travels during the year and plans for travel in 1938.

Executive Secretary V. P. Ahearn, in his annual report, said that the total output and value of sand and gravel in 1937 closely approximated the results in 1936, when a production of 125,-690,000 tons was valued at \$66,000,000. He said that the average prices of sand and gravel in recent years have shown a steady decline and attributed this condition in part to the competition by divisions of the government.

Mr. Ahearn, in discussing construction activity, said that private construction in 1938 will about equal that of 1937. A decline in publicly financed work will bring the total construction volume slightly lower than in 1937. More than 22,000 miles of all classes of highways were completed in the fiscal year 1937, exceeding by several hundred miles the work completed in the previous year. Grade-crossing elimination and protection work in 1937 far surpassed that of any other year, most of which was financed under the \$200,-000,000 grade-crossing program authorized by the Emergency Relief Appropriation Act of 1935.

Mr. Ahearn discussed at considerable length legislation enacted for highway construction and the benefits derived and the president's proposal to reduce federal funds for highway purposes. In his opinion, Congress favors the regular federal-aid highway principle and there are indications that bills already introduced to provide federal aid will pass.

In commenting on the safety contest conducted by the Association and supervised by the U. S. Bureau of Mines, Mr. Ahearn said that results achieved in the 1936 contest were not as favorable as in preceding years. The frequency rate per million man-hours increased from 26.5 in 1935 to 39.7 in 1936, while the severity rate rose from 4.5 to 12.7. He commented on the reasons for the increase and strongly emphasized the need for a real interest in safety, especially since obligations on the employer are constantly being increased by legislation.

The efforts of the association on behalf of its members in opposing freight rate increases were discussed. Carriers have recently petitioned the Interstate Commerce Commission for a 15 percent horizontal increase in rates for sand and gravel over and above the 5 and 10 cent per ton increase which has already been made effective.

Mr. Ahearn reviewed the work that had been done in regard to studying

the question of uniform cost accounting for the industry, which has assumed great importance now that legislative enactments have made exact cost determinations a matter of legal responsibility. The association has taken the system prepared in 1930 by a committee of sand and gravel producers in coöperation with Ernst and Ernst, which has been revised and made available to the membership. During the year, Mr. Ahearn has spent considerable time in the field addressing various state and district associations and other organizations.

In his report, he interpreted various legislative enactments which are of concern to the industry, including the Walsh-Healy Act, Federal Wage and Hour Control, Tax Legislation, the Anti-Trust Laws, the O'Mahoney-Borah Licensing Bill, Federal Housing Legislation and new proposals for wage and hour control tax legislation. In concluding, he commended the members for their wholehearted support and coöperation to the association.

Home Design Contest Scheduled for Fair

A \$250,000 INTERNATIONAL HOUSE DESIGN contest, which may revolutionize small home construction, is being planned by executives of the 1939 Golden Gate International Exposition. To encourage the development of all types of houses, it is planned to hold separate competitions for various types and sizes.

Three classifications have been proposed, including houses to cost \$5000 or less, houses unlimited in cost, and prefabricated houses. The prefabricated house contest will include competitions for precast concrete, steel, frame and other types of houses. It is likely that each house competition will be sponsored by one or more groups of material manufacturers. Cement companies, lumber firms and manufacturers of other building materials and accessories are expected to participate in the house design competitions.

METROPOLITAN LIFE INSURANCE CO. plans to invest \$100,000,000 in low rental housing, according to an announcement recently made by Chairman Frederick H. Ecker. An amendment to the New York insurance law to permit life insurance companies to acquire land and construct apartments and other dwellings is to be drawn up for action by the New York legislature.

FEDERAL SOIL CONSERVATION SERVICE crushed and applied 51,000 tons of agricultural limestone to Minnesota farm lands since 1934.

Selection of Aggregates and Admixtures For Best Results

BITUMINOUS MIXTURES

By BERNARD E. GRAY*

Chief Highway Engineer, The Asphalt Institute

IN CONSIDERING BITUMINOUS MIXTURES, the character of the final mixtures as a whole should be of more concern than the characteristics of the constituent parts. Adhesion of bitumen to aggregate, for example, is not covered by routine tests, and it may be due to mechanical, chemical and electrical forces. Only the resultant mixture will show how well the bitumen adheres to the aggregate. Some form of stripping test to predetermine behavior and the necessary remedy is indicated as a necessary test on all aggregates.

Road stabilization may be divided into two parts; stabilized subgrades, and stabilized base courses. In stabilized subgrades, where it is desirable to maintain a high bearing power which is obtained from an optimum moisture condition, excellent results are obtained by an admixture of granular materials, chemicals, cements, bituminous materials or a combination of these elements. Soil will be the largest proportion, the admixture bringing about stability through increased internal friction of the particles or a reduction in size of capillary pores to reduce entrance of moisture. For stabilized base courses, the sand-gravel mixtures should fall within the Fuller Curve band. If fines are deficient, increased stability will be secured by increasing the asphalt content, but it is more economical to correct the proportion of fines and use a minimum asphalt content.

To obtain the best results, moisture should be present. Where the material passing 200 mesh runs less than 12 percent, a moisture content of 3 to 4 percent is sufficient, but for higher percentages of fines, up to 15 percent moisture may be desirable. When using a high percentage of clay in the stabilized mixture, the asphalt content is figured against the 200 mesh fraction, approximating about 10 percent. With 40 percent clay, for example, about 4 percent of asphalt would be required, but as the 200 mesh content decreases, the asphalt serves as both a binder and waterproofing material, and should be figured against the total mass.

Some idea of the possibilities for road treatment may be gained from the fact that there are now nearly 90,000

miles of untreated gravel state highway roads. Surface treatment has been given to 43,000 miles of road.

In giving a priming asphalt treatment to a loose surface road from $\frac{1}{2}$ to $\frac{3}{4}$ -gal. is applied, but for a bonded



Bernard E. Gray

surface only $\frac{1}{4}$ -gal. is needed. The seal coat may be either cold or hot asphalt, but the application of the gravel cover should be made with full appreciation of its behavior. Aggregate applied with the seal coat should be of two sizes. For a 25-lb. application, the spreading of 15 to 20 lb. of particles above $\frac{1}{4}$ -in. followed by 5 lb. or more of sand sizes will result in a uniform appearance and a complete keying of the coarser particles. In retreatment work, the practice is to use $\frac{1}{4}$ -gal. of asphaltic material followed by the application of a coarse aggregate cover. Sand size aggregates to cover surfaces are recommended in the treatment of sheet asphalt streets. MC-2 or MC-3 cut-back asphalt is first applied, and then about 15-lb. of sand per square yard is spread, brushing the sand into the cracks.

A recent questionnaire showed that the trend is definitely in favor of the plant-mix as against the road-mix. While the road-mix method may be cheaper, there is a tendency to segregation, incomplete mixing and streaking. Both cold-laid and hot-laid mixes are

used. Specifications, however, usually provide that the use of gravel in hot-mixes be confined to crushed material with a minimum fraction of crushed particles. The criterion of suitability of an aggregate is not its ability to pass a sieve of a given diameter, but of its behavior in the final mixture. There should be neither use nor exclusion of any aggregate simply because it falls within such a category. Some rock is harder than other rock; also it may break into different shaped particles even though passing the same diameter sieve. The same thing is true of gravels; some gravels are softer than others, even though they may show the same total percentage of wear passing the same sieve. The true criterion is ability to withstand service in the final mixture, and to develop the necessary stability and durability under traffic. Some gravels are inherently extremely hard, their shape is conducive to high stability, and such materials should be used where economically available.

In the design of mixtures for road surfaces it is desirable to place any given thickness in two or more layers. The wearing course is required to be more dense than the binder or base courses and it is better to place a coarse aggregate mixture for the lower courses and a fine aggregate mixture for the top course than it is to make the entire depth of such gradation as will produce a fine textured surface. This is desirable because the coarser mixtures require less asphalt cement, are more pliable and more easily spread by mechanical means, and will more readily consolidate under rolling than fine mixtures. For this reason, with a 2-in. compacted thickness it is desirable to place a binder course of $1\frac{1}{4}$ - to $1\frac{1}{2}$ -in. depth and a surface course of $\frac{1}{2}$ - to $\frac{3}{4}$ -in. thickness. For the base course itself there is no reason why aggregate sizes should not run up to $2\frac{1}{2}$ -in. maximum where substantial foundations are placed. By suitable design of the composite layers, the entire pit output may be utilized and at a lower cost to the buyer.

Cold-laid mixtures are increasing in popularity due to their excellent service records, and a plant making the cold mix can increase its production from 50 to 100 percent over the hot-laid mixture.

*Abstract of an address presented before the recent annual meeting of the National Sand and Gravel Association.

What Our Laboratory Tests Have Shown During 1937

CRUSHED STONE RESEARCH

By A. T. GOLDBECK*

Engineering Director, National Crushed Stone Association

Two laboratory research investigations were conducted during the past year; the first, a series of tests involving the use of stone screenings for stabilized base construction, and the second being concerned with the effect of shape of the particle on the mortar-making properties of stone sand.

During recent years "stabilized soil", a term used to describe the treatment of natural soil to make it resistant to loads at all seasons of the year, has been given a great deal of attention by the highway engineering profession. In an effort to further improve stabilized roads, investigators have been adding admixtures, such as calcium chloride, to preserve a more favorable water content. Sodium chloride also has been used for this purpose. In addition to admixtures, bituminous materials, such as asphaltic emulsions, cut-back asphalts and tars also have been added in small amounts, primarily as waterproofing materials, and portland cement has more recently been used as a binder. As these stabilized layers are intended as low cost bases and not primarily as wearing surfaces, they must be protected by a bituminous wearing surface.

*Abstracted from an address before the National Crushed Stone Association convention in Cincinnati, January 24, 1938.

Stone screenings is a valuable material for stabilized base construction, and investigations have been made to determine the combination of gradation of screenings and of admixtures which give the most satisfactory results. A stabilized screenings base for highways should possess the following characteristics:

1. It should transmit super-imposed wheel loads to the sub-base without appreciable movement and with very little permanent deformation;

2. It should be able to perform this vital function under all conditions of weather and moisture;

3. In the event of partial failure under unfavorable subgrade conditions, it would seem desirable for the best results that stabilized screenings should have properties which will permit it to heal or reknit itself together again;

4. It should remain stable, even after evaporation of capillary moisture has been prevented by the application of a bituminous wearing surface.

It is concluded, that the maximum stability under wet conditions would be obtained by using particles so graded in size that they interlock and provide a mixture having the greatest possible density and smallest percentage of voids; that enough fine cementing material be used to aid in sticking the

coarser particles together; and that waterproofing be applied to the layer to exclude excessive quantities of water, or that the amount of water be controlled so that excessive film thickness of water will not be built up.

As gradation of aggregate plays an important part in controlling density, the investigations drew upon the studies of Wm. B. Fuller and Dr. C. M. Strahan. Fuller's curve of maximum density and Strahan's gradations furnished an excellent starting point for the tests. The work of Talbot and Richart was utilized as a method for determining the water content which would create maximum density in a mass of granular materials. The amount of bituminous materials to use was determined by trial, making use of different percentages, forming 1 x 1 in. cylindrical specimens under pressure to find the percentage of bitumen necessary to prevent excessive absorption of water.

The tests were carried out on the laboratory circular track, the testing device consisting essentially of a pneumatic-tired wheel, supporting a weight of 1900 lb. and attached to the end of a radial arm so that it could be rolled on the track which has a mean diameter of 14 ft. Test sections were laid on a concrete base having a trough shaped cross-

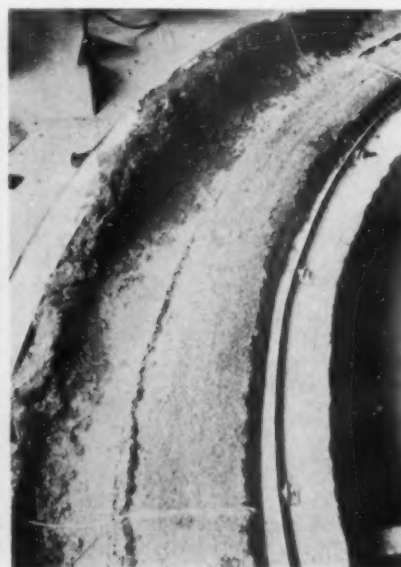


Fig. 1. Section 8 (with crack in foreground) and section 1, after 15 passes of loaded wheel, track wet. Fig. 2. Section 3, after 47 passes, track wet. Fig. 3. Section 8, after 47 revolutions with the track wet

section with curbs 6-in. deep. A plastic clay sub-grade was first rolled in place on the concrete base and the test sections were then laid on this clay sub-grade, simulating actual road conditions.

Three Gradations of Screenings

Three gradations of limestone screenings were used, representing the coarsest, intermediate and finest gradations which are normally produced. These gradations are as follows:

Table I—Gradation of Screenings

Sieve Size	Total Per cent Passing		
	Coarse	Medium	Fine
3/8 in.	100	100	100
No. 4	105	92	100
8	55	68	80
16	30	45	60
30	20	35	50
50	15	27	40
100	10	20	30
200	8	14	20

Test sections on the track included eight different mixtures which are as follows:

Table II—Stabilized Screenings—First Circular Track Test

Section Number	Gradation	Per cent ^a Water	Per cent ^a MC-1 Cut-back
1	Coarse	9.6	...
2	Medium	10.4	...
3	Fine	11.7	...
4	Fine and clay ^b	12.0	...
8	Coarse	9.6	3.1
7	Medium	12.1	3.6
6	Fine	12.1	3.1
5	Fine and clay ^b	12.0	3.1

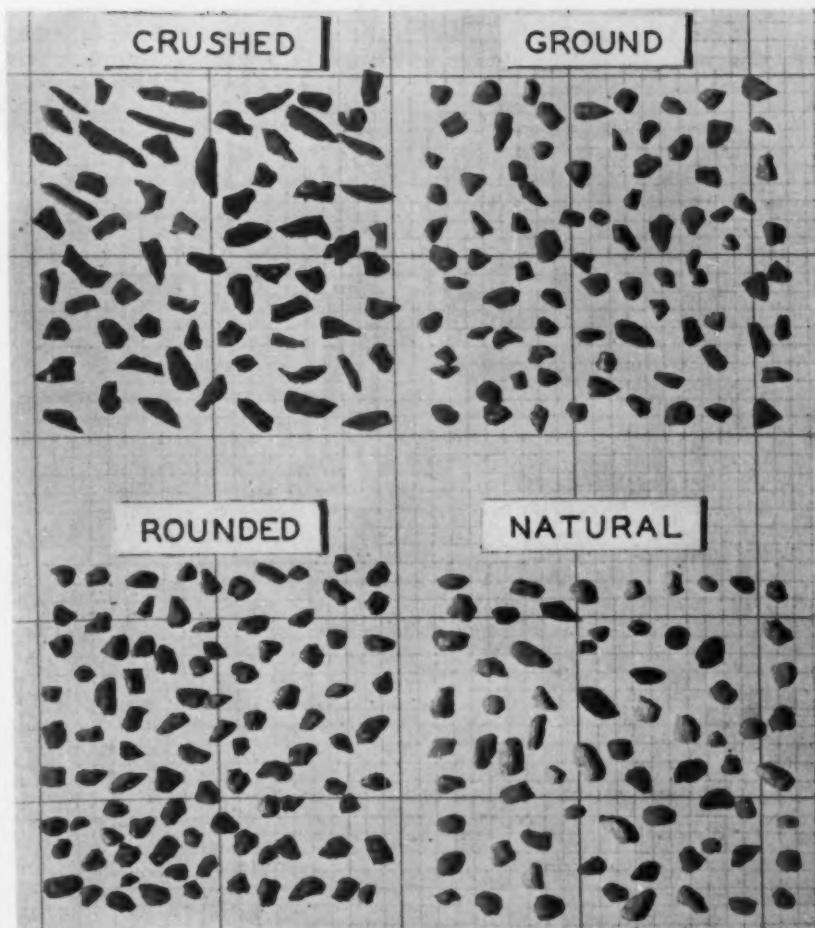
^a Percentages based on weight of aggregate.

^b The fine gradation had 20 percent passing the No. 200 sieve. For sections 4 and 8, 10 percent of clay was substituted for 10 percent of limestone fines.

After the surface treatment of the test sections had cured for two weeks, 2000 passes of the loaded wheel were made in order to thoroughly compact the track. The pavement was then ready for testing, but it was evident that section No. 5, made up with the fine gradation of screenings to which clay had been added in substitution for part of the limestone dust and containing the MC-1 cut-back asphalt was unstable. It was removed, and a slab of calcium chloride accelerated concrete inserted in its place in order to continue the test.

The first test consisted in operating the wheel in a single lane on the inner half of the pavement for 20,000 passes, measurements being made of the amount of rutting at various stages of the test. Results are given in Table III.

It is evident that all seven sections in their naturally dried condition were stable, but the most dangerous condition for stabilized base construction exists when there is excessive moisture present in the subgrade or on the road surface. Under wet conditions, the two coarse



Three samples of stone sand compared with natural sand from the Potomac River. At the left, above: Stone sand as it appeared when crushed in a gyratory crusher. To the right, above: Stone sand product from rotary grinder. To the left, below: Stone sand product from the improvised ball mill. To the right, below: Natural river sand

graded sections, Nos. 1 and 8, shown in Fig. 1, failed under only 15 passes of the wheel. Sections 2, 6, and 7 failed at about 47 passes and all of the sections, with the exception of No. 3, Fig. 2, had completely failed at 100 passes of the wheel.

Although no definite conclusions can be drawn from a single test, the indications from the first series are:

1. That stability under dry conditions is readily obtained, but a test made under these conditions is no indication of the probable behavior of the sections under wet conditions.

2. High density seems to be desirable to prevent the infiltration of water and to create high stability under wet conditions.

3. That provided, sufficient stone dust is available for high density, the addition of clay is not necessary and judging by a comparison of section 3, containing no clay with section 4 containing clay, it is obvious that the clay may actually be detrimental.

4. That MC-1 cut back asphalt exhibited undesirable properties for use in stabilized mixtures, probably due to the heavy nature of the volatile portion.

Table III—Results of Stability Test on First Circular Track

Section No. Grading Dry Track	Screenings—only				Screenings with MC-1 Cut-back		
	1 Coarse	2 Med.	3 Fine	4 F+clay	8 Coarse	7 Med.	6 Fine
	Rutting—inches						
After 4800 passes	.02	.03	.09	.15	.03	.08	.01
" 10,000 passes	.03	.03	.11	.17	.03	.09	.02
" 20,000 passes	.03	.03	.12	.17	.05	.09	.03
Wet Track							
After 15 passes	.95	.15	.00	.08	.71	.13	.32
" 47 passes	2.54	.32	.01	.27	2.49	.55	1.36
" 1000 passes	...	...	.17	...	...	...	...

In a second series of tests, the same aggregates and gradations were used as in the first series but 18 to 25 viscosity tar asphaltic emulsion, such as used for soil stabilization, and an RC-2 cut-back asphalt were substituted. The conditions of the second test were the same as in the first test, with the exception that the sections were allowed to cure two weeks instead of one week before applying the bituminous surface treatment. As water was the principal cause of instability in the first test, in the second test samples of moisture content were taken at various stages.

The second test again proved conclusively that high stability is easily obtained when the mixtures are in a dry condition, but when in a wet condition there is a wide range in stability. Apparently, gradation is the most important single factor in bringing about a stable condition under bad moisture conditions. The use of waterproofing materials such as tars, cut-backs or emulsions is not effective unless the mixtures are dense and have a sufficient amount of fine dust present. It seems that the best stability is obtained when the aggregate is graded to give high density and when there is sufficient bituminous material present to make for low absorption and to furnish some resiliency in the mix.

Effect of Shape of Particle In Manufacture of Stone Sand

Another subject of research by the association concerned the objection which has been raised against stone sand for use as a fine aggregate in concrete resulting from the reduced workability of concrete produced by the angularity of the particles. To study the effect of different shapes of particles, sand produced from the same stone using different methods of production were used. Three methods of production were employed in the laboratory: a small gyratory crusher, a grinder, and an improvised ball mill.

In preparing the stone sand, 1½-in. to 2-in. stone was first passed through the gyratory crusher having an opening of ¾-in. The product was slabby and angular, and the stone sand was prepared from it by the use of square opening sieves.

To produce stone sand having more cubical fragments, the No. 4 to No. 50 sieve material resulting from the gyratory crusher was passed through a rotary grinder. The principal effect of the grinding operation was to produce more cubical fragments due to breaking up, the more slabby pieces resulting from the crusher.

In these tests, sand classed as rounded was prepared by mixing together, in equal portions, the ¾-in. to No. 4 material from the gyratory crusher with the

No. 4 to No. 50 mesh material resulting from the grinder. This mixture was then placed in a small concrete mixer together with a large charge of steel slugs which was rotated 1¼ to 1½ hours. The result was a rounding off of the edges of the particles to some extent.

To express the shape of particles of sand, the influence of particle shape on the weight per unit volume, or on the percentage of voids was used. Each of the three sands mentioned above and also a sample of Potomac River natural sand was separated into the following fractions: No. 4 to No. 8; No. 8 to No. 16; No. 16 to No. 30; and No. 30 to No. 50.

The weight per cu. ft. of each of these fractions for each of the different kinds of sand was determined, and then, knowing the specific gravity, the voids were readily calculated. This test revealed that the stone sand crushed in the gyratory crusher had the highest percentage of voids; stone sand prepared with the rotary grinder showed the next highest percentage of voids; material prepared in the improvised ball mill was next; and the natural river sand showed the lowest percentage of voids.

Further tests were carried out with four different kinds of sands made up into five different gradations to determine the structural strength of sand. One to two mortar, by weight, was made of the four kinds of fine aggregates using five different gradations which resulted in 20 different mixtures. A flow of 110 was used, corresponding to the consistency of a mortar in 1:2:3½ concrete having a slump of 2 in. Test specimens were made up consisting of 2-in. cubes molded in accordance with Method T71 of the American Association of State Highway Officials. The test cubes showed that when very angular and sharp cornered sands containing slabby and needle-like pieces are used, a much higher percentage of water is needed in the concrete mixture than when a more rounded sand is used.

Curves for crushing strength made with tests of the cubes, previously mentioned, indicate that the more rounded

the limestone sand is, the greater is the crushing strength. The finer the gradation, the higher is the absorption, probably because of the larger amount of mixing water used. The more rounded the sand, the less becomes the absorption and the denser the mix. Freezing and thawing tests also indicate an improvement in resistance when the particles are improved in shape, probably due to lowered mixing water content.

Promotions

ASH GROVE LIME & PORTLAND CEMENT Co., Kansas City, Mo., recently announced the following promotions: Ding Burton, formerly special sales representative, to the post of assistant sales manager; Richard M. Slater, formerly acting advertising manager to the post of advertising manager. Both are of the Kansas City office.

Columbia Wins Safety Award

FOR THE SECOND YEAR, Krause Quarry No. 1, St. Clair County, Ill., has won the National Crushed Stone Association Safety Competition, having taken first place in 1935 as well as 1936. This quarry is a unit of the Columbia Quarry Co., St. Louis, Mo. During 1936, the quarry was worked 224,342 man-hours without a lost-time accident. This company's limestone mine No. 3, located at Valmeyer, Ill., also completed the year 1936 with a clear record, operating a total of 124,028 man-hours. Quarry No. 1 also was recently presented with a Jos. A. Holmes Safety Award for its record in accident prevention work.

Krause Quarry No. 1 has established a five-year record without a lost-time accident, no employee losing a day's work due to accidental injury since Sept. 22, 1932. The safety program includes a mass meeting of employees once a month. Monthly, permanent records are maintained, and the plant is equipped with a first-aid room with all the necessary emergency supplies.



Employees of Krause Quarry No. 1, unit of Columbia Quarry Co., St. Louis, Mo., winner of the National Crushed Stone Association safety award for 1936

Accurate Control of Materials with Plant Mixed STABILIZED AGGREGATES

By O. W. MERRELL*
Consulting Engineer, Columbus, Ohio

IN THE PRODUCTION of "Roadcrete," as produced by Roadcrete, Inc., at its Newtown plant, the stabilized aggregate is carefully designed and graded by sieve analysis to obtain maximum density, a clay soil binder is used, and flake calcium chloride is added to control the moisture content and keep the road surface dustless. Tests show resulting densities varying from 145 to 153 lb. per cu. ft.

The theory of stabilizing aggregates is not new, but embodies an old engineering principle of securing maximum density by ideal gradation of aggregates. This theory is similar to that of concrete, the only difference being the substitution of a low-cost soil binder in place of cement.

Among some aggregate producers there is an erroneous contention that permanent pavements should be discouraged because there may result a loss in tonnage in maintenance material which would have been necessary on loose gravel type highways. No manufacturer in any line of business can be ultimately successful in attempting to succeed by impeding progress and by fighting against that which is ultimately the most economical and convenient to the consumer and user.

If a low maintenance cost road is built, the money which would ordinarily be used by the government to maintain loose gravel highway will be used in extending the primary and secondary highway system, and thus opening for potential improvement a vast mileage of tertiary roads. Better roads also encourage increased use of the automobile

with a resulting increase in gas tax and license revenue. Aggregate users, however, are beginning to demand stabilization and the alert producer, sens-



Left to right: Earl Zimmerman and E. M. Trittschuh, Ohio Gravel Co., and Stanton Walker, National Sand and Gravel Association, talking over the possibilities of stabilized mixtures

ing this, will be in position to supply the demand as it arises.

Stabilized aggregates have opened up to the sand and gravel producer a large market for use on roads and streets of moderate traffic and for base course construction on heavy traffic pavements. For the producer, the stabilized mixture offers an opportunity to dispose of materials which may not be marketable for other purposes, such as small size gravel and coarse sand.

Another market for stabilized soil mixtures is for a low-cost material which may be used for a hard surface driveway in public parks, estates, cemeteries, etc.

Early experience with the road-mix method of applying stabilized mixtures was not very satisfactory because it was difficult to maintain accurate con-

trol of the materials and secure proper mixing, thereby resulting in a lack of uniformity in the road surface. The road-mix method also required considerable equipment which interfered with traffic, and work was also more dependent on the weather.

After studying these conditions, the officials of Roadcrete, Inc., built a central mixing plant for stabilized aggregates at Newton, Ohio, adjacent to Cincinnati. The plant consists of typical proportioning bins, screw-type feeders and mixers, and necessary handling equipment. Specifications and sieve analysis follow the recommendations of the U. S. Bureau of Public Roads. Some changes in specifications may have to be made by other producers, however, to take into consideration the available materials.

Although the Newtown plant has been in operation only a short time, the inquiries and actual orders received have been very satisfactory. Orders have been received from the county and city, and materials have been furnished for drive-ways on private estates.

Some idea of the immediate market for stabilized aggregates may be gained from statistics covering several Middle West states. The Michigan State Highway Department last December let contracts for 300,000 cu. yd. of stabilized gravel for 1938 maintenance requirements, and also let contracts for 185 miles of stabilized base courses, requiring 230,000 cu. yd. of gravel, all of which must be plant mixed. Indiana, Iowa, Minnesota, Ohio and Pennsylvania have built many miles of stabilized roads and appropriations for this type of construction are increasing.



Views of the Newtown plant of Roadcrete, Inc. Left: Feeder for aggregates from the rear or drive end. Center: Motor drive of feeder and mixer. Right: Pug mill mixer for sand and gravel aggregates and calcium chloride

Sand and Gravel Industry Studies Important

RESEARCH PROBLEMS

By STANTON WALKER*

Director of Engineering and Research, National Sand and Gravel Association

SOME OF THE INDUSTRY PROBLEMS, of an engineering nature, on which work should be carried out as soon as possible through the National Sand and Gravel Association Research Foundation at the University of Maryland include: sand and gravel in bituminous mixtures, sand and gravel in concrete, soundness of aggregates-deleterious particles, standardization of specifications, and production problems.

Since the pioneer days, there have been many modifications in bituminous mixtures, but most of them have been based on the belief that only an angular coarse aggregate is suitable. The gravel industry accepted that inherited belief and did not attempt to find out in what mixtures gravel is suitable or to develop mixtures which would make use of gravel most efficiently. In recent years, however, the trend in types of bituminous mixtures has been favorable to the use of gravel, the demand being for finer graded and denser mixtures, reducing the importance of angularity to stability. The problem of adhesion of various types of bitumen to various types of aggregates has come to the front due largely to development in the use of cold mixes.

Bituminous-Mixture Research

Two major investigations are suggested by the foregoing: 1. Effect of shape of aggregate particle on stability and durability of various types of bituminous mixtures; 2. Effect of mineral composition and surface texture of aggregate particles on the adhesion of various types of bitumens.

Several problems for investigation are suggested under the first heading:

1. What is a measure of shape of particle?
2. What degree of angularity is necessary for developing stability of various types of coarse graded mixtures, such as retreads and penetration macadam, and what percentage of crushed particles is necessary to provide that degree of angularity for gravels of various types—very round ones to very angular ones?
3. What is an effectively crushed particle—one fractured face, two fractured faces, all faces fractured?
4. What is the importance, if any, of angularity on the durability of thin surfaces—surface treatments, seals and the like?
5. What is the importance, if any, of angularity on the stability (and durability) of densely graded mixtures—asphaltic concretes, densely graded cold mixes, etc.?

*Abstract of an address before the recent convention of the National Sand and Gravel Association at Cincinnati, Ohio.

Methods and equipment for making the suggested investigations should include the use of the circular track or some adaptation of the idea; the Hubbard-Field machine; and the "Stabilometer."

While "stripping" (lack of ability of certain bitumens to adhere to certain aggregates) is not a problem of the sand and gravel industry alone, information available might be interpreted as indicating that this difficulty is more prevalent among gravels than among other aggregates. This study involves the determination of the relative affinity of the aggregates for water and bitumen.

Sand and Gravel in Concrete

Concrete is established as a market for sand and gravel, but there are some pressing questions to which answers are needed. It has been charged that "gravel concrete roads crack more than crushed stone concrete roads." This charge has been answered convincingly on many occasions. Gravel concrete roads do not crack more than crushed stone concrete roads, as a class, but, and this is important, concrete roads made out of some aggregates crack more than those made out of some others.

A multitude of factors, among which aggregates are only one, causes a concrete road to crack. However, the only important manner in which aggregates affect cracking is through their influence on the tensile strength and volume changes of the concrete.

In addition to size and grading, surface texture, strength of particle, and mineral composition are important aggregate characteristics which affect the ability of concrete to resist tension. Shape of particle, within the limits of normal aggregates, is of negligible importance, and there is little evidence to substantiate the claim that a fractured surface is beneficial.

Most of the tests of concrete strength with relation to different aggregates have been made with applications of static loads. Very little information is available as to the relationship between different aggregates when impact loads are applied; when thousands upon thousands of repetitions of load are used; and as to what proportion of its ultimate strength may concrete, made with differ-

ent aggregates, be stressed repeatedly without fatigue.

Volume changes have an effect on the cracking of concrete roads and other structures. It is also known that aggregates have an effect on the volume changes of concrete. Present data are conflicting and need clarification. Further investigation is needed to measure the volume change of concretes made with different aggregates, under different conditions, and also to find a method of measuring volume changes of the aggregate particles themselves. These studies, and others involving questions relating to design, size and grading, and durability, will be made if the program of the Research Committee and of the Board of Directors, receives adequate support.

Soundness of Aggregates

Further information is needed on the problem of soundness of aggregates. The following questions are suggested: 1. What is a satisfactory method of test for soundness—the sodium sulfate test, the magnesium sulfate test, the freezing and thawing test, or others?; 2. For a given method of test, what result, or results, draws the dividing line, or lines, between satisfactory and unsatisfactory aggregates?; 3. What types of particles, mineralogically, are sound and what unsound, and what proportion of unsound particles are permissible under different conditions?; 4. What is the relationship between soundness tests of aggregates and soundness tests of concrete?

Sodium and magnesium sulfate tests made by the association have been of considerable value to the industry. Lack of equipment has prevented freezing and thawing laboratory tests, and for similar reasons studies have not been made of the soundness of concrete in relation to different aggregates.

Standardization

Considerable progress has been made by the Association in standardization of specifications. Evidence of this progress is to be found in the Simplified Practice Recommendations covering size and grading of crushed stone, slag and gravel developed by the three mineral aggregates associations in cooperation with the Division of Simplified Practice of

(Continued on page 56)

First Meeting Lime Putty Producers

SO MANY ready-mixed concrete producers in the big cities have added lime putty and ready-mixed lime mortar to their products that the Lime Putty Products Association's first regular annual meeting was held at Cincinnati, Ohio, February 1, to coincide with the annual meeting of the National Ready-Mixed Concrete Association. The Lime Putty Products Association was organized in Washington, D. C., a little less than a year ago (ROCK PRODUCTS, May, 1937, pp. 78-79).

The original officers were reelected: Irving Warner, Philadelphia, Penn., president; E. S. Simpson, Washington, D. C., vice-president; Hayden Brooks, Birmingham, Ala., secretary-treasurer, with the exception that Herbert Jahncke, New Orleans, La., was elected vice-president in place of Durando Miller, New York City, in order that the officers might better represent the industry geographically. About 70 members and guests were present.

After a historical resumé of the association and its rapid growth, President Warner invited all lime putty and lime mortar manufacturers to join, whether they are using the Brooks-Taylor process or not. Most of the producers using this new process are veterans of earlier plants using the Blue Diamond or some other process.

Selling

Milo E. Smith, advertising manager, Chicago Bridge and Iron Co., spoke on methods of merchandizing and sales promotion, in which he covered promotion practices quite thoroughly. Most such material has been so thoroughly covered in text-books that there is little new to be said, but Mr. Smith did compress a great deal into a short talk. Being a relatively new industry using a new type of plant, he particularly mentioned the advertising and promotional value of "open houses" at the plants for customers and prospects.

Plaster Mortars

John C. Best, president, Best Bros. Keene's Cement Co., discussed the possibilities of lime plaster, gauged with gypsum or Keene's cement. This part of the ready-mixed lime mortar business has not yet been developed to any great extent. He said that in the case of transit-mixed lime mortars, the mixing time must be accurately determined because it is possible to over-mix lime mortar and thus destroy its virtues.

Lee S. Trainor, National Lime Association, covered the subject of lime masonry mortars quite comprehensively.

He advocated the mixing of the gauging portland cement with the lime mortar in the truck mixers; while this destroys the early strength of the mortar, early strength is not essential in this instance.

Lime Putty in Ready-Mixed Concrete

Alex Foster, Jr., Warner Co., Philadelphia, Penn., discussed what promises to be a large new market for lime putty—its use in ready-mixed concrete. It overcomes the sloppiness of ordinary ready-mixed concrete, and according to research work now in progress may prove to have other virtues. Mr. Foster did not recommend portland cement-lime putty mixtures for concrete exposed to aggressive waters.

Hayden Brooks, Brooks-Taylor Co., Birmingham, Ala., brought the meeting to a close with a description of his own progress in promoting the use of lime plaster. Mixed 1 cu. yd. of sand, 9 cu. ft. of lime putty and 300 lb. of Best Bros. Keene's cement for the rough coat, and 1 cu. yd. of sand, 7 cu. ft. of putty and 200 lb. of Keene's cement for the scratch coat, the plaster had proved very satisfactory on a new large store job in Birmingham.

Ohio Sand and Gravel Assn. Promotes Accident Prevention

AT THE ANNUAL MEETING of the Ohio Sand and Gravel Association in Cincinnati, Ohio, February 1, Wm. Edward Hole, Greenville, Ohio, was re-elected president. The other officers are chosen by a board of directors of 20.

President Hole reviewed the progress of the association for the past year and the outlook for 1938, which did not at that time seem likely to come up to 1937. The year 1937 showed a decrease of about 10 percent in volume of production as compared with 1936. Decrease in public works demand has not yet been offset by private building—and diversion of gasoline taxes seriously threatens highway construction.

Accident Prevention

The association sponsored a statewide accident prevention campaign in 1937 with excellent results. Some 62 sand and gravel producers were enrolled—both member and non-members of the association. Under the Ohio workmen's compensation laws employers must insure with the state bureau or carry their own insurance. Since the rate used by the state bureau is based on the experience record of the industry in the state, very appreciable savings are possible if the industry's record is improved. It is possible to save all of the dues necessary to maintain the state association in this way, so that this is a business proposition as well as a humanitarian one. There are about 120 sand and gravel producers insured in the state bureau, and every effort will be made to interest them all in the association's 1938 campaign.

This activity of a state association is of more than passing interest for it points another way of making them useful and profitable to their industry. So far as we know the Ohio Sand and Gravel Association is the first such state association to conduct a competitive accident prevention campaign and thus supplement the efforts of the National Sand and Gravel Association in the same direction.



Group of producers at Ohio Sand and Gravel Association luncheon, Fred E. Hall, a Cincinnati host, in the center

Economic Advantages of Combining Two Businesses

LIME PUTTY and READY-MIXED CONCRETE

By NORMAN G. HOUGH*

SEVERAL IMPORTANT FACTORS influence the successful operation of lime putty plants and the distribution of the product. To have a good idea of the economic soundness of a lime putty plant, it is also essential there be a reasonably good understanding of the problems involved.

One of the problems involved in the use of mortar is the leaking wall problem. About 35 years ago, the only material generally used for masonry mortar was a mixture of lime and sand. At about the same time builders began to use a small amount of Portland cement as a gauging material in the mortar to accelerate hardening, and it worked well.

Because it worked well, a theory developed that because a little worked well, more would work better. The cement content was therefore stepped up until one part Portland cement and three parts sand was used. Some builders allowed 5 or 10 percent lime to be used with the cement mortar, but others did not use any lime. During this period, however, considerable demand developed for waterproofing materials, recognizing the fact that there was a leaking wall problem. There was no leaking wall problem 35 years ago.

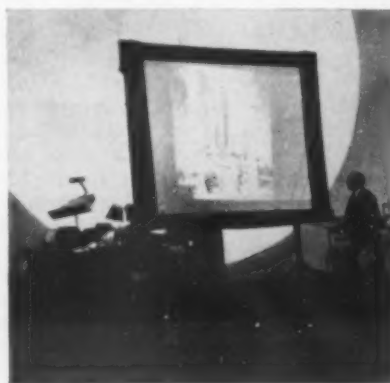
So-called masonry cements were then tried in an effort to get away from leaking wall conditions. The troubles were not eliminated, and about 1925 so much difficulty was experienced that architects demanded an answer to the problem and laboratory research was made of all materials; lime, cement, masonry cements, bricks and waterproofings. From this laboratory research work, information is now available as to the properties a mortar must possess if sound, watertight and durable brick work is to be obtained. The trend is now back to a lime mortar gauged with Portland cement.

Merchandising Aged Lime Putty

With gauged lime mortar on its way back, it is believed that aged lime putty, due to the plasticity and workability which it imparts to the mortar, is the most logical way to use the lime.

Perhaps the first attempt to merchan-

dise lime putty on a large scale was the Blue Diamond lime putty plant at Birmingham, Ala., which involved the construction of large concrete vats for draining and aging and the investment of \$75,000 to \$100,000. This plant, however, led to the development of the present low cost, efficient putty plant, known as the Brooks-Taylor system.



Norman G. Hough delivering illustrated address at National Ready-Mixed Concrete meeting

Ten of these plants are now operating successfully in various parts of the country, and most of them are run by ready mixed concrete producers. Experience obtained in association with the Richter Concrete Corp. in Cincinnati, Ohio, is convincing evidence that the lime-putty plant offers the best means of meeting the demand for mortar.

Several lantern slides were displayed to show a lime putty plant with the necessary sand handling equipment capable of producing products for distribution in three different fields: lime mortar to be gauged with Portland cement; lime plaster gauged with Keene's cement for the base coat of plastering; and lime putty for the finishing coat of plaster.

Some idea of the market for lime putty may be obtained from the fact that for every thousand brick laid, approximately 16 cu.ft. of wet mixed mortar is consumed which would require from 4 to 6 cu. ft. of lime putty. An average two story dwelling of six rooms requires from 12,000 to 25,000 bricks, depending on whether it is veneered or solid masonry. In Cincinnati on a government housing project which required 6,000,000 bricks, the Richter Concrete

Corp. furnished approximately 4500 cu. yd. of transit mixed mortar from its lime putty plant, all of which was delivered without an additional investment in delivery equipment.

Lime Plaster

Although hardwall plaster has dominated the field for a number of years, lime plaster gauged with Keene's cement has been found to be a good non-conductor of sound. In this connection it is of interest to know that in practically all federal government work, lime and Keene's cement is specified on a parity with competitive plaster, and as a result this plaster has been used in a number of government buildings.

Before the days of finishing hydrated lime, the only material which was used for white coat plastering was aged lime putty but the long time required to properly slack and age the lime turned users to finishing hydrated lime. With aged lime putty easily available from a modern putty plant, there appears to be no reason why a larger share of this market may not be obtained.

Ready-Mixed Concrete Plants

Producers of ready mixed concrete are logically the ones who should be most interested in going into the lime putty business. The following reasons are given why they should be interested:

Ready mixed concrete producers now have nearly all the delivery equipment necessary to handle a substantial volume of lime mortar business without additional investment. Sand supplies are now available, and only a slight rearrangement of sand bins for more economical handling may be required. With sufficient delivery equipment available, a lime putty plant would present an opportunity to use this equipment more extensively and therefore more profitably.

As a general rule, ready mixed concrete must be delivered when the contractor calls for it, usually from 9 to 11 a. m., and from 1 to 3 p. m. On the other hand, lime mortar may be delivered late in the afternoon when the concrete business tapers off. Lime mortar can stand indefinitely without harm. When the contractor is ready to lay brick, all he has to do is to add the proper amount of Portland cement for gauging and the mortar is ready for the bricklayer.

*Abstract of a paper presented before the recent annual convention of the National Ready Mixed Concrete Association, Cincinnati, Ohio.

Medical and Engineering Control for Silicosis

OCCUPATIONAL DISEASE PROBLEM

By HENRY D. SAYER*

Manager, Casualty Dept., Association of Casualty and
Surety Executives, New York City

NO EMPLOYER CAN reasonably object to fair compensation for the disabilities and deaths due to trade risks, just as they do not object to making compensation for disability and death due to injuries by accident, but between this conception of industry's responsibility for industrial disease and the conception of some who advocate the so-called "all-inclusive" plan, there is a wide gulf.

In bringing occupational diseases under the law, the intelligent, reasonable and effective way is to list in the law the diseases that are to be compensated, together with a description in very general terms of the process or work in which the disease develops. This method which is followed by many states and nearly all foreign countries is certain and sure; the worker knows for what ills he will be compensated, and the employer is apprised of the diseases for which he will be held responsible and may thus adopt reasonable safeguards against their happening.

However, the "all-inclusive" method does not mention any specific disease in the law but makes compensable any and all diseases that arise out of and in the course of employment, leaving it entirely to the fairness and good judgment of the local administrative officers to apply the law to the facts in any case. No definition of the term "occupational disease" is given, and there really isn't any definition. Considerable controversy is promoted by the use of indefinite terms.

Under this liberal interpretation, any disease of any nature may be an occupational disease, depending only on the supposed source or the manner by which it arose. The law would cover not only those truly occupational diseases like silicosis, lead poisoning or benzol poisoning, but might cover pneumonia, tuberculosis, heart disease, cancer, arthritis, rheumatism, asthma, sinus trouble, sore throat, and even the common cold. Every disease named has constituted a claim in one or another of the states where this all-inclusive method is now in effect.

A case of national interest (Bishop vs. Comer & Pollock, 251, app. Div. 492)

*Abstract of an address before the recent annual convention of the National Crushed Stone Association.

was recently carried to the Court of Appeals, the highest court in New York, which clarifies the law with respect to compensation for occupational diseases. In this case, a man working at a butcher shop, who went in and out of the icebox many times a day subsequently contracted tuberculosis, and the claim was made that tuberculosis was an occupational disease. The Court of Appeals unanimously refused to concede the ground of occupational disease in this case. The court held that to make every disease that arises out of and in the course of employment compensable as an occupational disease would be to make the compensation law "the equivalent of life and health insurance." The court further said that to be "occupational" the disease must be one which "results from the nature of the employment" and that by "nature of the employment" is meant conditions to which all employees of a class are subject and which attach to the occupation "a hazard which distinguishes it from the usual run of occupations, and is in excess of the hazard attending employment in general." (Goldberg vs. 954 Marcy Corp., decided Jan. 11, 1938, 276 N. Y. 313).

States which have adopted schedule laws include: Delaware, Pennsylvania, Michigan, Rhode Island and Washington; and Ohio has enlarged its former schedule to include silicosis. Illinois and Indiana have adopted modified plans for all-inclusive coverage.

Medical and Engineering Control for Silicosis

Prevention of silicosis is possible through engineering control and medical control. By crushing or abrasive action on silica rock a fine powdery dust is given off which creates an inherent risk of the business. All dust cannot be eliminated, but medical opinion holds that there are dilute conditions of dust that are probably not harmful. However, by engineering control, intelligently applied, the free atmospheric dust can be kept down to those safe dilute conditions.

A difficult problem in the industry, however, is the old worker. Ordinarily silicosis does not proceed to disablement until after an exposure to silica dust of ten or more years, depending upon the

resistance of the individual and the concentration of the dust, but when a fibrous condition of the lungs has developed, it is permanent and is not susceptible of treatment.

This condition has resulted in what is called "accrued liabilities" in dusty occupations. When a new law becomes effective, bringing silicosis within its provisions, many men will have been working in dust for a number of years preceding enactment of the law. They have acquired an amount of lung fibrosis which is permanent and may be progressive but which may not at the moment be disabling. With employment steady and wages good, it is much less likely to be disabling than would be the case in time of depression and unemployment. These men are not in a true sense insurable, but the employer has a potential liability as to all such employees. In the case of an accident-prone employee, an employer may prevent losses from accident by the discharge of the employee, but this is not the case with an employee who has been exposed to dust.

In 1936, a group of experts studied the question of silicosis under the sponsorship of the Secretary of Labor, and one of the recommendations of this group was that while full liability from a social standpoint should be imposed for disability or death from this cause, full liability for employers is not feasible because of the accumulation by employees of pathological conditions due to previous exposures.

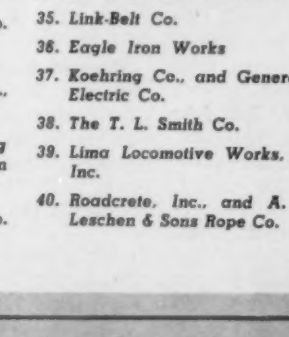
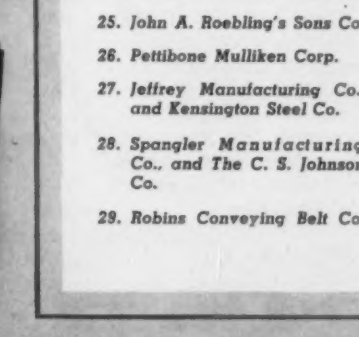
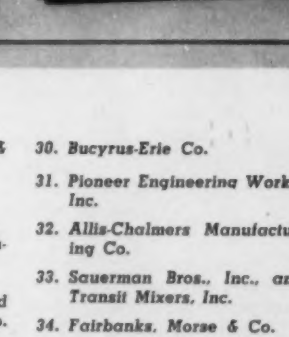
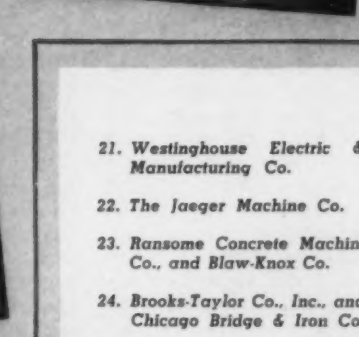
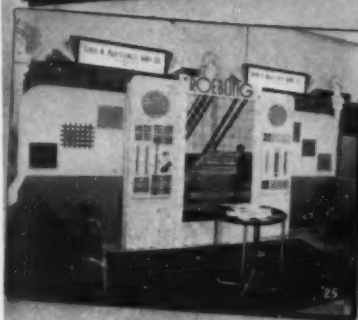
New York, Michigan, and Ohio have incorporated in their compensation laws a scale of limited benefits during a transition period to lighten the burden of industry before it takes over all the accrued liabilities. Each of these states has adopted a plan for limiting the total compensation for any case of silicosis to a maximum of \$3000, providing that such maximum only be paid in a case where there has been an exposure of at least four years, states the new law. Under the new law, benefits increase slightly with exposure, increasing at the rate of \$600 for each year of exposure. Pennsylvania not only has an occupational disease law that contains a schedule of diseases covered, but in the case of silicosis, limits the employer's liability for each individual to \$3600.



A Tour Through the Exhibits

<p>1. Chain Belt Co.</p> <p>2. Harnischfeger Corp.</p> <p>3. American Manganese Steel Co. Div. American Brake Shoe & Foundry Co.</p> <p>4. Dempster Bros., Inc.</p> <p>5. Hardinge Company Inc.</p> <p>6. McLanahan & Stone Corp., and The Thew Shovel Co.</p> <p>7. Cross Engineering Co.</p> <p>8. Easton Car & Construction Co., and the Blaw-Knox Co.</p> <p>9. Peoria Steel and Wire Co.</p> <p>10. Traylor Engineering & Manufacturing Co.</p> <p>11. Hendrick Manufacturing Co.</p>	<p>12. Marion Steam Shovel Co., and Atlas Powder Co.</p> <p>13. Nordberg Manufacturing Co.</p> <p>14. Kennedy-Van Saun Manufacturing & Engineering Corp., and Taylor-Wharton Iron and Steel Co.</p> <p>15. E. I. duPont de Nemours & Co., and Brooks Equipment Co.</p> <p>16. National Supply Co.</p> <p>17. Gruendler Crusher & Pulverizer Co., and Pressed Steel Car Co., Inc. (Koppel Div.)</p> <p>18. Screen Equipment Co.</p> <p>19. Hercules Powder Co.</p> <p>20. The W. S. Tyler Co.</p>
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21. Westinghouse Electric & Manufacturing Co.
22. The Jaeger Machine Co.
23. Ransome Concrete Machine Co., and Blaw-Knox Co.
24. Brooks-Taylor Co., Inc., and Chicago Bridge & Iron Co.
25. John A. Roebling's Sons Co.
26. Pettibone Mulliken Corp.
27. Jeffrey Manufacturing Co., and Kensington Steel Co.
28. Spangler Manufacturing Co., and The C. S. Johnson Co.
29. Robins Conveying Belt Co.
30. Bucyrus-Erie Co.
31. Pioneer Engineering Works, Inc.
32. Allis-Chalmers Manufacturing Co.
33. Sauerman Bros., Inc., and Transit Mixers, Inc.
34. Fairbanks, Morse & Co.
35. Link-Belt Co.
36. Eagle Iron Works
37. Koehring Co., and General Electric Co.
38. The T. L. Smith Co.
39. Lima Locomotive Works, Inc.
40. Roadcrete, Inc., and A. Leschen & Sons Rope Co.



Jurisdictional Disputes Require Legal Control

LABOR PROBLEMS

By V. P. AHEARN*

Executive Secretary, National Sand and Gravel Association

A PROGRAM has been worked out by the National Sand and Gravel Association through which member companies may call upon the association for advice on any phase of labor relationship; questionnaires have been sent out to member companies and the information compiled for use of producers; copies of labor contracts, without identification of the member company involved, may be obtained; bulletins are issued covering objectionable provisions in labor contracts; and an outline of a labor contract form has been prepared for use of member companies facing demands of a union for collective bargaining.

The questionnaire survey revealed that while union agreements have been more frequent in the past two years, the sand and gravel business is still essentially an open shop enterprise. Most of the signed contracts have been under the auspices of craft unions composing the local building trades councils of the AFL. The seasonal character of the business, as brought out in the survey, calls for a weekly and not for a daily limitation, and both wage and hour agreements have reflected the desire of employees to secure the largest possible amount of hours of employment during peak-load seasons.

Boycott Threats

As producers market their materials in metropolitan centers where the local building trades councils dominate the sites of construction, the industry is vulnerable to the boycott threat. To organize plants, unions issue an ultimatum to employers that unless contracts are signed with the craft unions, union forces on the construction jobs will refuse to handle the materials. Usually the boycott threats are made before the business agents of the union organize the employees, the union confining its dealings with the employer.

An employer signing a union contract under these conditions is undoubtedly guilty of a deliberate violation of the National Labor Relations Act or a similar state law as he is interfering with the free choice of union affiliation

by his employees if he compels his men to join a union. However, the employer is forced to take his choice between two unpleasant alternatives; either to comply with the spirit and letter of the Wagner Act by refusing to deal with the union unless they actually represent his employees or to surrender to the ultimatum and require his employees to join a union which the employer has selected. Many employers have been forced to take the last alternative on the basis that, law or no law, the craft unions were in position to determine the company's business future. It is believed that public opinion in the long run will rise up against boycott threats and the craft unions using them will find that they cause them more harm than good.

Collective bargaining under the protection of Federal and State laws is probably a permanent part of our statutes. Employees always have had the natural right of collective bargaining. The Wagner Act, however, is one-sided in that it imposes obligations upon employers while freeing unions of any responsibility for the fulfillment of contracts. It is doubtful that the Act will be amended in the present session of Congress, but there is considerable pressure to investigate the Labor Board out of which will come some specific proposals for a modification of the law. Federal incorporation of unions is not the real solution of the employer complaints, and it is well to keep in mind that if the federal government can incorporate unions, it can also require the incorporation of business.

One of the most desirable modifications of the Wagner Act would be a clarification of meaning of certain provisions which are now left to a high-handed board for interpretation. The term "collective bargaining" is subject to conflicting interpretation.

Jurisdictional Disputes Should Be Controlled

Jurisdictional disputes also present a question over which some kind of legal control should be exercised in the public interest. The Labor Board will not offer an employer any relief should he be caught between two fires when a competing union boycotts the plant. A case in point is the experience of a

ready-mixed concrete plant which had signed a contract with the truckers and chauffeurs union and had agreed to sign a contract with the hoisting engineers union for the mechanical employees actually in the plant. The engineers union, however, insisted that a hoisting engineer be put on each truck.

Referee Rules in Favor of Truckers

When the company failed to accept this unreasonable demand, the hoisting engineers' union sought the assistance of the local building trades council, who submitted the question to the building trades department of the AFL. This department held that a resolution adopted in 1907 by the Federation gave the engineers jurisdiction over "cement mixing", and therefore the position of the engineers must be supported. The truckers' union resisted this ruling, but the company experienced job boycotts. Finally, the ruling by the building trades department was appealed to the referee in jurisdictional disputes, Dr. Lapp, who disapproved the claim of the engineers.

With this ruling of the AFL referee, the ready mixed concrete company cannot be held to be unfair to organized labor if it refuses to sign an agreement with the hoisting engineers' union which provides either for placing one of their members on each truck or giving them exclusive control over the dumping of loads at sites of construction. This was not a case of a jurisdictional dispute as a claim between two competing unions for the right to have the membership of a specific employee, but was a demand that the company employ a large group of men which admittedly it did not need and whose services were not required.

In spite of these difficulties, there is no reason why employers and employees cannot get along harmoniously. A necessary prerequisite to that harmony is intelligent and sympathetic consideration of the employees. Every employer in the sand and gravel and ready-mix industries should subject himself to a critical self-examination as to whether he has failed to do his part in correcting labor problems.

* Abstract of a report presented at the recent annual convention of the National Sand and Gravel Association and the National Ready Mixed Concrete Association, Cincinnati, Ohio.

A. I. M. E. Increases Interest In INDUSTRIAL MINERALS

By NATHAN C. ROCKWOOD

AT LEAST 1400 members of the American Institute of Mining and Metallurgical Engineers are primarily or greatly interested in the industrial minerals field—the rock products field. Not a great many of them at present are active producers or operating officers of producing companies; many are in foreign countries; many are consulting engineers, U. S. Bureau of Mines officers and college professors. Nevertheless, the mere number of professional engineers interested in industrial minerals ought to impress producers and operators in the rock products industry that much technical information is being acquired and exchanged within this group, to membership in which many technically educated and trained producers and operators in the rock products industry are eligible.

At the regular semi-annual winter meeting of the Institute in New York City, February 14-18, special prominence was given the sessions of the Industrial Minerals Division. J. R. Thoenen, U. S. Bureau of Mines, College Park, Md., who has devoted most of his activities for several years to developing technical information on operating and economic problems of the rock products industries, was elected chairman of the Division for 1938, succeeding Chester A. Fulton, president of the Southern Phosphate Corp. Mr. Thoenen has initiated a program for 1938 which it is hoped will interest more actual producers in the activities of the Institute.

At the annual dinner and reception to introduce the new president of the Institute, D. C. Jacklin, of Utah and Nevada copper mining fame, another man well known to the rock products industry, was signally honored. Hal Williams Hardinge, president of the Hardinge Co., York, Penn., was awarded the James Douglas Medal of the Institute "for his inventions of apparatus for fine grinding ores, and achievements in improving practice in that art." One of his chief inventions was that of the conical ball mill, which is familiar to the rock products industry.

Most of the technical papers and discussions of interest to rock products men were in the sectional meetings on industrial minerals, but one session on mining methods included valuable information on minerals separation, which is assum-



J. R. Thoenen

ing importance in several rock products operations. One of these papers dealt with the newly-developed art of electrostatic separation, by Herbert B. Johnson, vice-president, Ritter Products Corp., Rochester, N. Y.

Electrostatic Separation

Mr. Johnson's paper described chiefly experimental work to determine what he named electrical conductivity of various minerals in terms of voltage. His paper contains a list of 90 minerals and their electrical conductivities, both positive and negative. Differences in their conductivities make it possible to separate one mineral from another as they drop in a thin ribbon between charged electrodes. The commercial possibilities of the process have recently been greatly enhanced by improvements in producing high voltage electricity such as full-wave, vacuum-tube rectification and improved mechanical rectification, and improved insulators for high voltage work. Machines have already been put into operation which will treat commercial tonnages.

Closed-Circuit Grinding

Walter M. Stephen, assistant mill superintendent, International Nickel Co., Copper Cliff, Ont., in a paper "65-Mesh Grinding in Closed Circuit with Stainless-Steel Screens," described the use of Hum-mer vibrating screens with stainless-steel cloth in closed circuit with a wet-grinding, 6½- x 12½-ft. Marcy rod mill, which had an output of 625 to 820 tons of ore per day of approximately

65-mesh. With ordinary steel screen cloth difficulty is experienced with rust blinding. His conclusion was: "By virtue of the stainless steels (18 percent Cr, 8 percent Ni), it is no longer true that classifiers are more economical than screens in closed circuit with large-tonnage ball or rod mills at 65- or even 100-mesh, provided a selective overgrind of the higher-gravity constituent of the ore is not desired." This may have some bearing on slurry grinding in the cement industry.

Grindability Characteristics

To those interested in the theory as well as the practice of crushing and grinding a paper by Fred C. Bond and Walter L. Maxson, both engineers with the Allis-Chalmers Manufacturing Co., contains much of value. It is entitled "Grindability and Grinding Characteristics of Ores"—a continuation of two earlier papers presented to the Institute. In the present one are described methods of calculating surface areas from screen fractions and of determining the efficiency of grinding mills from the new surface area produced. Also described is a pendulum device for determining the grindability factor ("surface energy") of ores or other minerals. Tests were made on two portland cement clinkers and results compared with those published by R. Wilson [A.I.M.E. Tech. Pub. 810 (1937), abstracted in Rock Products, March, 1937.]

The authors explain that the term *grinding efficiency* has several different meanings, as for example *new surface efficiency*, and *mesh size efficiency*. Each of these efficiencies can be expressed in terms of power consumption, mill size, operating cost, etc., so that many different opinions as to what constitutes efficient grinding are possible. It is desirable that all of the limitations be fully understood and expressed if valid comparisons are to be made. In grinding cement clinker, control was formerly based upon screen analysis, and the operating conditions, such as size of grinding media, mill speed, etc., were adjusted to make a product of the desired fineness (or percentage passing 200-mesh) most efficiently. The present method of measuring fineness by specific surface area is a distinctly different objective and the most efficient grinding

conditions from the standpoint of screen analyses may not be the most efficient from the standpoint of new surface produced.

The authors also bring out this interesting fact, established by tests with an experimental mill: Series of grindability tests at various meshes from 28- to 200-mesh show that without exception the new surface area produced per revolution of the mill is the same for all of the various meshes (of the same material). In other words, one revolution of the mill will produce the same amount of new surface for the particular material, independent of whether it is being ground to minus 28-mesh, to minus 200-mesh, or to any size in between—also that the new surface produced per revolution of the mill is independent of the amount of circulating load, in closed-circuit systems. This is explained by the fact that while larger tonnages of "finished" product are produced by increasing the circulating load, the "finished" product is lacking in the finer grain sizes which call for increased work.

While dealing largely with ores and wet grinding, portland cement plant operators will find the paper of great interest, and suggestive concerning many of their own practices and results.

Industrial Minerals

Several of the papers at the sessions of the Industrial Minerals Division were read at the Washington meeting last October and abstracted in our report of that meeting (Rock Products, November, 1937), and will not be referred to here. A new one was "The Bald Eagle Magnesite Mine, California," by Jos. B. Perry, and G. M. Kirwan, of the Westvaco Chlorine Products Corp., Gustine, Calif., which described the deposit and method of mining in detail.

Silica Sand

G. A. Thornton, vice-president and secretary, Ottawa Silica Co., Ottawa, Ill., described "Preparation of Silica Sand as a Raw Material for the Manufacture of Chemical Products." In his absence the paper was read by F. H. Reed, of the Illinois Geological Survey. The deposit and method of recovery were described in considerable detail. Uses and grades of silica products were described in less detail.

Filters

Donald F. Irvin's (Oliver United Filters, Inc.) paper on "Filtration Methods for Industrial Minerals" was very general. He said that some of the largest installations were filtering portland cement slurry, and that each slurry was different and required a different technique.

S. B. Kanowitz, Raymond Pulverizer Division, Combustion Engineering Co.,

New York City, said the tendency at present was to refine industrial minerals at the source (at the producer's plant) instead of at the user's, as heretofore. Refining or concentration by air separators is an example. Lime and limestone are quite generally refined in this way. A newer development is the removal of impurities from pulverized coal, to be used in firing rotary lime kilns. Drying and grinding in one operation was dealt with briefly.

Economic Principles

A paper by Clyde W. Hall, vice-president, United Clay Mines Corp., while it dealt with clay mining exclusively, contained helpful information for analyzing the economic possibilities of any industrial mineral deposit. It was entitled "Economic Principles in Clay Mining."

Ground Mica

Ground mica, often produced as a by-product, apparently has great possibilities, according to Paul M. Tyler, U. S. Bureau of Mines, whose paper "Technology and Economics of Ground Mica" is probably the most comprehensive discussion on the subject yet available. Mica is difficult material to grind satisfactorily, which, with the small tonnages produced, accounts for its high price (\$20 to \$100 per ton).

Puzzolanas

A paper, "Coöperation of Puzzolanic Materials with Portland Cements," by Roy W. Carlson, professor of civil engineering, Massachusetts Institute of Technology, contained little new information. He listed the various puzzolanas available, including boiler fly ash.

Safety

An excellent, brief summary of the portland cement industry's organization for the prevention of accidents was described in a paper by A. J. R. Curtis, assistant to the general manager of the Portland Cement Association. To the excellence of its accomplishments a splendid tribute was paid by Dan Harrington, U. S. Bureau of Mines, who also praised Mr. Curtis and his patience and persistence in pursuing his objective year in and year out for a quarter century. Mr. Harrington said the success of the P. C. A.'s safety work was largely because the executives of the industry had become really interested.

Iowa consumption of agricultural limestone in 1937 will amount to an estimated 1,000,000 tons, according to B. J. Pirkins, Iowa State college agronomist. This places Iowa in the class with Illinois as the two largest users of agricultural limestone.

Research Problems

(Continued from page 48)

the National Bureau of Standards, most of the standardization has been in connection with grading, but an investigation concerning physical characteristics of aggregates should be carried out. This research, covering aggregates from different sections of the United States, should consider grading, soundness, resistance to abrasion, specific gravity, absorption, mineral composition, concrete-making properties, affinity for bitumens, and other questions.

Production Problems

Questions relating to production problems should be studied. The laboratory could be used to determine the efficiency of soft stone eliminators, flat particle eliminators, and similar equipment. Other studies could include: methods of removing tenacious coatings, classifications and washing methods and their efficiency, crushers and crushing methods, bin and stockpile uniformity, and different methods of loading. A valuable service also would be given by the laboratory if member companies would co-operate in a survey of their deposits with the object of increasing the efficiency of production.

Other important problems in the field of sand and gravel research may also be listed, such as: effect of grading and other characteristics of sands; stability of railroad ballast; drainage of railroad ballast; studies of stabilized aggregate mixtures; studies of plaster and mortar sands; tests of the hardness and strength of aggregates; design of concrete mixtures; design of bituminous mixtures; workability of concrete; density and permeability of concrete, and many others.

MINNESOTA PIPESTONE QUARRY has been taken over by the Federal Government as a national park. These quarries were operated by the North American Indians long before the white man appeared on this continent and therefore are probably the oldest commercial quarries now within the United States.

HUGH MURRAY, owner of the gravel plant south of Equality, Ill., leased the plant to A. K. Moore, who in turn sub-leased it to John Denison of Equality. Improvements contemplated are a screen, a stone crusher and a loading chute for loading trucks. A new excavation is to be made.

H. W. SHAULL AND SONS, stone quarry at New Kingston, Penn., was damaged by fire recently to the extent of \$8000.

Correlate Aggregate Tests with Actual Service Behavior

LOS ANGELES RATTLER TEST

By F. H. JACKSON*

Senior Testing Engineer, U. S. Bureau of Public Roads

AN INFORMAL TALK was given on the subject of the Los Angeles Rattler Test and its application which was illustrated by a number of slides. For complete details, the reader is referred to a paper presented before a meeting of the Highway Research Board in Washington, D. C., in December.

The old Deval test was developed in Paris around 1880 as a method of measuring abrasion in the old horse-drawn traffic days, and was not a test for the structural strength or impact resistance of stone. On the other hand, the Los Angeles abrasion test does measure impact and structural strength of the aggregate to a much more critical degree. The Los Angeles test has three distinct advantages over the old Deval test: tests can be made in less than 20 min. as compared with 5 hr. for the old test; it is fairly independent of such variables as shape and angularity of fragments; and it is possible to test the finely processed material just as it is ready for use.

Slides were introduced to show an illustration of the Los Angeles Rattler, which consists essentially of a hollow cylinder, closed at each end, 28-in. in diameter and 20-in. long, with a 3½-in. shelf projecting radially in the inside of the cylinder. A function of the shelf is to catch the charge of aggregate and shot, lift the charge and shot, and throw it down as the cylinder rotates. This severe action introduces the elements of impact and abrasion to a marked degree and results in losses in a very small number of revolutions. Another slide showed the latest recommended design of cylinder with the shelf bolted to the inside of the cylinder rather than one mounted on the cover.

Another slide showed a chart on which was plotted the results of tests of two different sizes of materials. In one grading of material, the maximum size was 1½-in. and in the other a maximum size of ¾-in., but the results were fairly consistent. Another graph showed the relation between the wear and the length of run or length of test for a material of uniform quality, indicating

that it is proportional. When different percentages of very much softer material are added progressively, it will be noticed that the wear at the end of 100 revolutions becomes larger in propor-



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Frank H. Jackson

tion to the wear at 500 revolutions, and this is to be expected as the soft material is lost first, breaking down to dust immediately. This test provides a method of determining the deleterious effect of soft fragments in a given sample. With this test the specification for material could state, for example, that the loss at 500 should not be more than 35, and the loss at 100 should not be more than 10. The California Highway Department is now using this procedure.

Other slides showed the lack of agreement as far as individual tests are concerned, between the old Deval test and the present Los Angeles test. The chart again indicated that the Los Angeles test does measure the service value of material for various types of roads.

Relation Between Strength of Concrete and Rattler Test

The maximum Los Angeles test limits which should be imposed in order to obtain satisfactory material for three types of construction; portland cement concrete, bituminous construction, and

bituminous concrete, were shown on one of the slides. The slide indicated that there was considerable variation between the different states, but this was attributed to the available source of local supplies of materials. Averages of the various states, however, showed 45 percent for concrete, 40 percent for bituminous work, and 40 percent for surface treatment.

The Bureau is now running a series of tests in an attempt to correlate the Los Angeles test with a roller test in the laboratory. In this test a segment of a roller is passed across the top of the sample and the change in gradation of the material is measured and related to the Los Angeles rattler test loss, in an effort to determine whether the Los Angeles test measures the tendency of aggregate to crush under the roller. A similar test made at Michigan State College indicates that the higher the loss from the Los Angeles test, the greater the loss under the roller.

Results of tests giving the relation between strength of concrete and the Los Angeles abrasion loss, shown on another slide, pointed to a fairly definite correlation between the strength of the concrete and the results of the Los Angeles test.

In a Texas State Highway Department test it was shown that the quality of the stone is much more influential on the strength of the concrete for the richer mixture than for the lean mixture. With very soft material around 70 percent, a concrete is obtained with a compressive strength of 4000 lb., as against 6000 lb. with material around 30 percent loss. North Carolina tests show that in the matter of flexural strength there is a variation from 450 p.s.i. up to 700 p.s.i., depending upon the type of aggregate used. Pennsylvania tests indicate that when the Los Angeles abrasion loss is above 35, there is probably more than 6 percent of soft fragments in the stone.

On the basis of the data available, the following percentages of wear appear to be suitable for use in specifications to control the quality of coarse aggregates: portland cement, 50 percent; bituminous surfacing, 40 percent; and surface treatment, 40 percent.

* Abstract of an illustrated talk before the National Crushed Stone Association at Cincinnati, Ohio.

Sand-Lime Brick Association



J. Morley Zander, left, talks it over with J. E. Rasmussen, Acme Brick Co., Milwaukee



Apparently nothing was going to get by W. F. Dall, Northern Indiana Brick Co.



A couple of listeners are cornered by Jack Garcia, National Brick Co., Long Island



An attentive listener was J. L. Jackson, as he assumes a characteristic pose

THE SAND-LIME BRICK INDUSTRY has definitely turned its attention toward the manufacture of larger units to meet the competition of other building units. A number of manufacturers have already been converted, and are now manufacturing cinder concrete blocks and sand-lime blocks even to the point where their production exceeds that of sand-lime brick.

Considerable discussion at the annual meeting of the Sand-Lime Brick Association in Cleveland, Ohio, February 14, 15 and 16, revolved about the importance of these larger units in future markets and how the industry should take advantage of its available high pressure steam-curing equipment in the production of concrete masonry.

New Association Officers

J. C. R. Felker, Missouri Hardstone Brick Co., St. Louis, Mo., was elected president of the association; T. W. Smyth, York Brick Co., Toronto, Ont., Canada, is the new vice-president; and J. Morley Zander, Saginaw Brick Co., Saginaw, Mich., was reelected secretary-treasurer. T. H. Lineaweaver, Harold J. Levine and F. Langdon Hubbard comprise the executive committee.

Retiring President Levine, in his opening address to the convention, emphasized the part that larger building units are to play in the future markets and stressed the need for meeting this competition by preparing to manufacture building block of various sizes. He pointed out the advantages of steam-cured concrete units over those cured by other methods, and how easily concrete products made from various aggregates can be made by the sand-lime brick industry, using the identical equipment now in use for the curing of sand-lime brick.

In a subsequent talk on the same subject, Mr. Levine briefly described the manufacture of 8- x 8- x 18-in. cinder concrete block and other sizes at the plant of the National Brick Co., Long Island City, N. Y. The manufacture of cinder concrete masonry was begun at this plant on the request of those desiring a quality building block.

The only new equipment installed was a block machine. The Jackson and Church rod mill already in operation was found to be entirely satisfactory for the crushing of cinders. By reducing the number of rods in this mill by about 50 percent, a well-graded cinder aggregate is produced, which is mixed dry with the cement. The dry mix is elevated to a paddle mixer similar in shape to a log washer, where water is added, and the

mix is then ready for the block machine.

Mr. Levine has found it to advantage to use high early strength portland cement in all units, even when curing by high pressure steam to reduce breakage to a minimum in placing and handling units in the curing drums. Less cement is used and considerable labor is saved in the handling of cement sacks.

As soon as the units are made on the machines, they are placed on racks in the kilns and are permitted to acquire an initial set for two or three hours be-



Newly-elected president, J. C. R. Felker of the Missouri Hardstone Brick Co., St. Louis

fore being subjected to steam curing. The steam pressure is gradually raised to 140 or 145 p.s.i. at a corresponding temperature of about 350 deg. F. and is withdrawn slowly after eight hours treatment.

Mr. Levine said that the only difficulty encountered at first was the fact that cinder concrete units so made were several times stronger in compression than was required, and these strengths had to be reduced in order to retain the nailable properties desired in cinder concrete. Reducing the cement content was, of course, a satisfactory solution. Units are manufactured to test 1200 to 1500 p.s.i. gross area.

According to Mr. Levine, these units exhibit practically no volume change when in place and have a pleasing light bluish gray appearance that is distinctive. The texture is very uniform and the process of curing has made the units unusually repellent to water.

Tests of wall sections composed of these units, made at Columbia Univer-

Studies New Market Outlets

sity, were reviewed. The units when heated to 1700 deg. and plunged into cold water showed no cracks or crazing. When compared for shrinkage with a similar wall section of units not cured by high pressure steam, 70 percent of the shrinkage was eliminated and a good percentage of the actual shrinkage shown could be attributed to the mortar.

Comparison of Large Units

J. Morley Zander, Saginaw Brick Co., Saginaw, Mich., spoke on the same subject and stressed the relative merits of sand-lime block and concrete block. To compare the physical characteristics of the two units, he displayed a conventional sand-lime block and one of concrete made with a mix of ten pounds of lime to a sack of portland cement, and sand. Lime was added to give a white appearance.

In the discussion that followed, it was contended that while concrete units are more costly to manufacture, the selling costs would be less due to the intensive promotional activity already given to concrete masonry. Some manufacturers felt that the sand-lime brick manufacturer could push both block products to advantage by "engineering selling," and contended that sales of sand-lime block would be accomplished easier if steam-cured cinder concrete blocks are also manufactured. One manufacturer said that he had been forced to manufacture concrete blocks, since his available sand had too low a silica content to make sand-lime block.

Research Activities

Dr. Lansing S. Wells, National Bureau of Standards, Washington, D. C., gave an interesting talk on research being done on the reactions of lime, silica and water at high temperatures, the results of which have not yet been published. Dr. Wells was quite active during the entire convention in discussing various technical questions that came up in the open discussions.

Haakon Paulson, sales manager, Besser Manufacturing Co., Alpena, Mich., gave an illustrated talk on various types of block-making machinery and placed emphasis on recent improvements to facilitate better product quality. Slides were used to show details of construction, machinery models and products made on them.

An interesting development shown on these slides was a handling device developed by Edwin Smythe, Wisconsin Brick Co., Madison, Wis., by which green sand-lime block could be handled and piled

on top of each other without pallets. The device is similar in some respects to that used for handling brick and consists of two boards, metal straps and a handle. When a block is lifted by the handle, the two boards pull together to grip the unit.

Mr. Smythe began the manufacture of sand-lime block in 1936, and the "tongs" were developed to save on pallets and to increase the number of 8-in. units from 46 to 64 to a car.

Selling the Architect

F. Langdon Hubbard, representing the Genessee County Brick Co., Flint, Mich., and Block and Brick, Inc., Detroit, Mich., spoke informally on "Selling the Architects." Mr. Hubbard stressed the need for selling the architect by direct contact and advertising; and the desirability of having his full cooperation in order to place the sand-lime brick industry on a firmer basis. He said that when such selling is properly done there will be a good chance to get a better price for the products. He stressed the desirability of getting sand-lime products written into specifications even if only as an alternate. Too often, said Mr. Hubbard, the selling job is done too late, when the contract on a particular job has been already awarded.

Raw Materials for Sand-Lime Brick

Theron C. Taylor, Belle Isle Lime Co., Detroit, Mich., discussed the "raw materials" used in the manufacture of sand-lime products. In his opinion, sand-lime block need not be competitive with concrete block, because of their advantages in color and their low-shrinkage. He believes that there is a good field for colored sand-lime brick if strong colors be made available. He discussed the various types of limes available on the market and suggested various bases on which lime might be specified by the sand-lime brick industry in the future. Mr. Taylor thinks that there is a big waste of lime accumulated in the sand voids in brick made by present methods.

John L. Jackson, Jackson and Church Co., Saginaw, Mich., the founder of the sand-lime brick industry in this country, took an active part in all discussions. He personally congratulated all those who had helped build the industry. He reviewed business conditions and in particular building prospects, which he thinks are optimistic because of an enormous pent-up demand for homes.

Mr. Jackson suggested that plants be put in readiness for some good business and emphasized the need for active co-operation between manufacturers



T. W. Smyth of the York Brick Co., Toronto, Canada, was elected vice-president



Dr. Lansing S. Wells of the National Bureau of Standards, Washington, D. C.



F. L. Hubbard, Block and Brick, Inc., Detroit, left and retiring president Harold Levine



Edwin Smythe, Wisconsin Brick Co., left, chats with Dan Colmar, Ramloc Stone Co.



Roy W. Crum

Present and Future of CONCRETE

By ROY W. CRUM*

Director, Highway Research Board

IN SPITE OF THE GREAT IMPROVEMENTS which have been made in the technology of concrete production over the past 30 years, there is *not* a parallel increase in quality. Good concrete was made in 1907, and it is still going strong. However, we now know how to make the same quality of concrete more economically, with a greater variety of materials and with more assurance of uniformity.

From a critical standpoint, concrete has its imperfections but it is a remarkable material in that the product is often reasonably good, even though it may be prepared without adequate knowledge of the constituents and their proper control in the mixture. Development of portland cement concrete on a scientific basis, however, has suffered from the handicap that "anyone can mix together some water, cement and rock particles and get a mass that will harden, carry a load and often last a long time."

More basic research into fundamentals should make it possible to control many of the factors that, uncontrolled, lead to imperfections. Take, for example, the cracks caused by contraction in drying. At least 15 variables are involved, including chemical composition of cement, character and grading of aggregates, richness of mix, etc., but the fundamental laws which govern drying contraction are not known.

Design of Mixes

Trial mixes are required to determine the proper water-cement ratio and amount of aggregates which will give suitable workability in concrete for pavements, but even trial mixes may not produce the desired results under

placing conditions on the road. There must be developed a test for workability that will identify the consistency of a mixture which will work properly when placed on the road; one of the first studies in this direction should be the relation of the characteristics of aggregates to workability of concrete. European engineers are returning to the use of grading curves which are of value in arranging economical proportions with a measure of workability control. Vibration in the placement of concrete is a new factor in the workability problem that must be studied in relation to proportioning.

While research has not as yet advanced far enough, there is no reason why it should not be possible to take samples of cement and aggregates and analyze them, measure their various properties and from this data calculate the relative amounts that, when mixed together under controlled conditions, will produce concrete of known strength and workability for a specific method of placing.

A method whereby the relative values of different curing processes may be compared is very much to be desired. Ponding and damp earth coverings were the original methods employed to provide excess moisture after placing concrete in pavements and floor slabs, but various kinds of coatings are now being advocated. Until more is known about the effects of forces at work during the setting and hardening period, however, little progress can be made in evaluating the various curing processes. It is known that plenty of water is needed after the mixture is in place, but nothing is known about the function of water, especially excess water, in the hardening process.

While concrete is recognized as a durable material, there are enough instances of its going to pieces to create a serious problem and the factors that influence its durability are not well understood.

Experimentation has been concerned principally with subjecting concrete and its ingredients to influences simulating climatic conditions to identify certain deleterious materials. These accelerated tests with chemical agents and frost action have revealed some new information. The National Sand and

Gravel Association has taken a leading part in this research work. Possibilities of failure of concrete will not be eliminated until the processes of hardening and the physical properties of hardened concrete are fully understood.

Concrete is composed of a mass of rock particles of all sizes and mineral compositions held together with whatever it is that cement becomes when it hardens. These particles, both large and small, change their sizes with changes in temperature, and this apparently solid concrete is continually in movement with the different rock particles trying to work independently. The binding power of the cement is the element which makes these numerous movements synchronize with each other and work as a unit. Under these conditions, it is remarkable that most concrete is as good and dependable as it is.

The leaching action of percolating water also may destroy the bond between the particles, particularly if this is accompanied by reaction with some chemically active constituent of the water. For this reason, it is important to use a mixture which prevents the movement of water in the concrete.

It is not very difficult to appreciate that the concrete mass will go to pieces if there is any failure in the cementing medium and in the aggregates or if the forces that cause differential expansion and contraction in the mineral particles are too great for the strength of the cement. This should be an important research objective.

Although it is obvious that expansion and contraction cannot be stopped, the selection of aggregates becomes very important as one aggregate may require less cement to hold the mass together than another which may have less uniform volume change characteristics. These differences in thermal properties between various aggregates requires much more study, and research into the volume change characteristics of individual particles of mineral aggregates of all kinds and sizes is essential. Before this is done, however, someone must devise a method for measuring the volume changes in irregular shaped rock fragments. Aggregate producers should lead in research work along this line as the problem of durability is perhaps the most important before the concrete industry.

*Abstract of an address before the National Sand and Gravel Association convention in Cincinnati, Ohio.

What Is Ahead for

HIGHWAYS

By CHAS. M. UPHAM*

Engineer-Director, American Road Builders Association

EVERYONE IS SOLD on the idea of more highways, but the difficulty is that the lawmakers and those who pass upon appropriations are not sure of the relative importance of highways.

Today the program largely centers around federal aid. Since the depression the relative amount of federal money in the highway program has jumped from around 7 or 8 percent to about 45 percent. Federal aid also has been instrumental in establishing standards and specifications, and has been effective in preventing the diversion of highway income by the states. The Bureau of Public Roads under Section 12 of the Hayden-Cartwright Act may withhold up to one-third of the federal allotment from any state not maintaining certain standards or if it diverts funds.

At least 50 percent of the sand and gravel business is obtained from the highway program, and the continuation of this construction is therefore vitally important. Present funds available for this program comprise \$150,000,000 left over from earlier appropriations, which has to be matched with like funds by the states; \$275,000,000 is to be spent by the states on non-federal roads; and the 1939 federal aid program together with matched funds amounts to \$350,000,000, giving a total authorization for highways of \$925,000,000.

Taxes Exceed Highway Expenditures

This program was placed in jeopardy, with President Roosevelt's recommendation to Congress for the cancellation of the 1939 authorizations prior to January 1, by which date the Secretary of Agriculture was required to apportion to the various states \$214,000,000 of such authorization under the Hayden-Cartwright Act. The recommendation further called for the limitation of this authorization to \$125,000,000 for the fiscal year 1940 and for each of the next few succeeding years. This would reduce federal aid from \$200,000,000 down to \$125,000,000. Congress refused to act, however, and the Secretary of Agriculture was compelled to apportion the funds as provided in the law.

*Abstract of an address before the recent meeting of the National Sand and Gravel Association at Cincinnati, Ohio.

President Roosevelt had requested the reduction in the appropriation for highways on the plea that the budget had to be balanced and that the funds for highways did not take many people off the relief rolls.

It may be pointed out that when it comes to the matter of balancing the budget everyone desires this to be done, but the highway program expenditures in 1937 represent \$20,000,000 less than the federal income received from taxes paid by the highway user. In fact, if all the tax money, which has been received by the federal government from highway users since 1916, was balanced against the money paid out in federal aid for the same period, the highway users have paid into the Treasury



Chas. M. Upham

\$190,000,000 more than was paid out for highway purposes. This more than balances the budget.

As a matter of fact, the withdrawal from the federal treasury, if the 1939 money had been apportioned to the states, would be only \$40,000,000, because there are only 10 or 12 states that were ready to go ahead on the 1939 program. In view of this situation it is not believed that the President has the proper information when he speaks of the highway authorizations and the cancellation of the 1939 authorization on the basis of balancing the budget.

On the question as to whether federal

aid highway appropriations take people directly off the relief rolls, some interesting figures have been prepared by the Bureau of Public Roads which indicate the federal aid dollar is broken up in trade and wages to \$3.15 in a very short time and as this is doubled with the state dollar, the federal money really means wages and trade to the amount of \$6.30. Approximately 85 to 90 percent of the highway dollar goes to labor. Although the direct labor on a highway may vary from 12 to 24 percent, the indirect labor for materials and machinery add considerably to the proportion received by labor.

Highway improvement is not just another government function which can be turned off and on, expanded or contracted, without serious consequences; it is intimately tied up with the basic economic and social objectives of the present administration. In his recent message to Congress, the President sought the cooperation of industry with the government with the object of raising the purchasing power of the country from 90 billion to 100 billion dollars, but the only way to raise the purchasing power is to foster the improvement of capital and labor in useful and productive services that bring in turn more employment for more people. Purchasing power may be redistributed by merely taxing those productively employed in order to maintain on a subsistence basis those who are unable to find productive employment, but it cannot be increased in that way. Cooperation must be a two-way process. If government wants the cooperation of industry, it should put a premium on those activities that will help industry to maintain its end of the process.

To show the growing interest of labor in the highway program, the American Federation of Labor recently sent a representative to attend the hearings before the House Roads Committee. He testified that the A. F. of L. was opposed to the reduction or the cancellation of the 1939 federal aid to the highway program. The Army also is interested very keenly in the highway program since its motorization activities have been inaugurated. Maps have been sent out by the Army to all state highway departments, including first, second and third priority maps, with the request that state highway departments construct highway systems to conform with the priority maps.

If federal aid is not continued to the states, there will be a tendency in the states to divert money which is now being used to match federal funds. The Hayden-Cartwright Act has forced states to return money to the highway program and it has kept money allocated for this purpose which otherwise would have been taken from the highway program.

Belt Operator Loses Life Through Carelessness



FATAL ACCIDENT AT COAL HOPPER

Regular Safety Inspections Needed

UNLOADING and other work around coal hoppers is not necessarily dangerous, but as the fatal accident we are about to describe shows clearly, careful operation and supervision are necessary at all times.

A hopper-bottomed car of coal was spotted on the track above the hopper in a cement plant coal department, where it was the duty of the coal belt operator to unload it. Between 4 and 5 o'clock in the morning the coal house operator, being unable to draw any coal, walked out to the conveyor and then to the hopper, where he discovered the body of the belt operator, head and face downward, shutting off the flow of coal.

The victim obviously had fallen into the hopper through an unprotected opening between the track rail and the platform at the side. This opening was 17 to 18 in. wide, and approximately 10 ft. in length, affording opportunity for a man to fall through under certain

conditions. The only reasonable conclusion that could be arrived at was that while the victim was kneeling on the platform and leaning over the hole to poke down coal from above, he was caught in a sudden flow and stunned or knocked off his balance, causing him to fall through the hole. Death apparently was due to suffocation by the coal.

Absence of injury to the body and careful inspection of the surroundings indicated a lack of other complicating circumstances. Artificial respiration was attempted, although unsuccessfully, and it seems quite evident that death had occurred by suffocation perhaps 45 minutes before the body was discovered.

Failure in Little Things Causes Accidents

The accompanying sketch and photograph give a good idea of conditions at the point where the accident occurred.

Let us consider some of the contributing circumstances:

1. No hole should have existed in the platform large enough for a man to fall through.

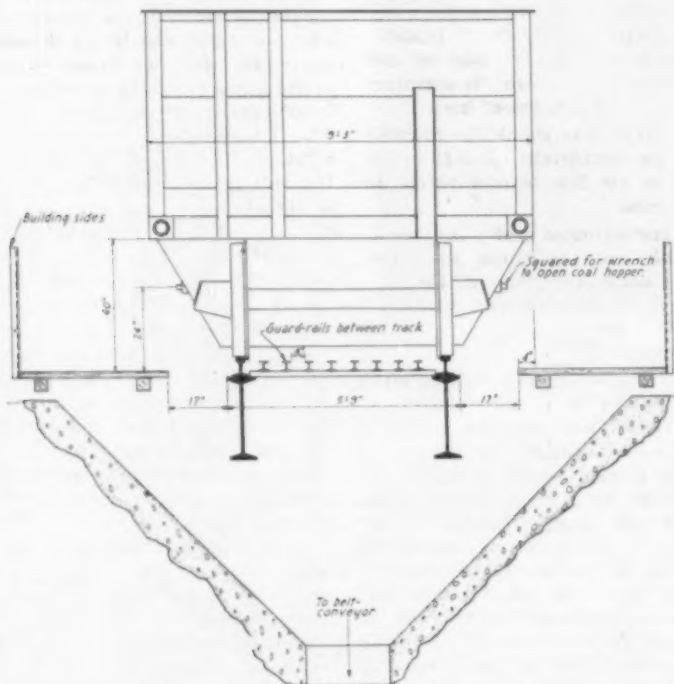
In the course of the investigation it was brought out by the plant management that the width of the hole originally was not over 14 in., which was probably quite safe. The hole had been made wider without regular authorization and quite unnoticed until after the accident. The most likely theory advanced was that someone had quietly increased the width of the opening for the purpose of better accommodating the flow of coal from car hoppers. If this explanation is correct, it leads us to some interesting speculation.

How could this change have remained unnoticed if, as stated, the superintendent made daily rounds of the plant and the department heads made several rounds daily? Were not the cut ends of the unpainted platform boards visible? Where did the saw come from which did the cutting? Out of the tool room without authority? Had it been loaned for the purpose by a carpenter? Isn't it evident that efficient inspection would have revealed this change?

Such detail usually is not obscure to competent safety inspectors. There is, of course, the possibility that the change had been discovered but that the person or persons who discovered it failed to sense the danger or to follow through and see that protective features were installed. If cutting of the platform was desirable, isn't it reasonable to assume that the foreman should have discovered the fact first and had the matter attended to in the regular manner, guarding the danger point at the same time? Why should anyone have thought it necessary to make such a change surreptitiously?

2. No operator, in unloading coal, should get under the car or in any location where he may be hit by coal leaving the car.

This company had a rule to that effect. Was it enforced? Operators had been instructed to bar coal only from above in case of stoppage. Isn't there ground for the suspicion that the unfortunate victim in this case had



Cross section drawing, showing coal car spotted on track above hopper, and platform which was cut away without authorization by workman, allowing belt operator to fall into hopper

formed a habit of barring coal from below to save the trouble of climbing up on the car?

From the foregoing it seems evident that not only had well-established rules and common practice been violated by the victim, but both inspection and supervision seemed to break down as well. Is it not likely that similar mistakes are being made elsewhere?



Showing how platform opening was enlarged, permitting man to fall into hopper

Around cement, lime, gypsum and aggregate plants, safety inspections cannot be made with too much care. Likewise, those in a supervisory capacity cannot be too careful in instructing men and in demonstrating to them, safe procedure. It is equally necessary that supervisors be eternally vigilant to make sure that their men are actually following safe practices as instructed and shown.

This accident occurred before daylight. While artificial lighting was quite ample, many industries make it a practice to unload coal only during daylight. Sufficient hazard is involved in coal unloading to warrant frequent watching by the foreman, particularly where one man is at work alone. It would be good practice for the foreman to visit and check up on the operator every fifteen or twenty minutes.

The employee who sacrificed his life to carelessness in this case had been considered reasonably careful. He was a man past fifty years of age, had been employed four years, and left a wife and three children.

COLUMBUS, OHIO, it is reported, will obtain 80,000 cu. yd. of crushed stone for street repairs from the filter beds of the old sewage disposal plant, which has been replaced by a new one.

Relations of Government to Industry

AT THE RECENT CONVENTION of the National Crushed Stone Association held in Cincinnati, Ohio, the Committee on the Relations of Government to Industry presented a very constructive report with some sound recommendations. Otho M. Graves, chairman, introduced the report which was accepted.

The report affirmed the desire of the crushed stone industry to co-operate with the Government in the effort to effect needed reforms, but burdensome taxation and fears generated by the threats of Federal legislation, which would undermine the system of private enterprise for profit; and public statements and speeches of government spokesmen attacking industry and business have made it difficult to contribute to this program of reform.

To improve relations between the Government and industry, the crushed stone industry outlined a program which should be followed:

1. Private enterprise for private profit free from the abuse of monopolistic practices should be encouraged and stimulated.
2. The Government should promptly announce a long-term policy of understanding coöperation with industry thus relieving it of its present doubts and fears as to the future.
3. Oral and written attacks from authoritative sources upon the integrity of industry for the purpose of inflaming public opinion should immediately cease.
4. Those who by their acts in industry and business offend the laws of our country should be brought to summary trial through due process of law.
5. Anti-trust laws should be clarified so that the industrialist is left in no doubt as to the line beyond which he may not cross.
6. The undistributed profits tax should be abolished and the capital gains tax should be materially reduced. Both of these taxes in their present degree of magnitude have contributed to the present recession.
7. The government should consult representatives of industry and business, at least, as freely as it does labor leaders, agriculturists, economists, and all others who can constructively contribute to the welfare of the nation.
8. The budget should be balanced and ultimately the public debt reduced, a circumstance which would enormously strengthen the confidence of the Nation and stimulate the energies of its people.

Federal Legislation

In commenting on proposed legislation, the report called attention to the continuance of authorized Congressional

appropriations totaling \$216,500,000 for federal-aid highways, as provided in the Act of June 16, 1936, for each of the fiscal years 1938 and 1939. President Roosevelt had recommended to Congress the cancellation of the 1939 appropriation and the limitation of expenditures in 1940 and succeeding years to \$125,000,000. A flood of objections to this proposal resulted in a refusal on the part of Congress to curtail these funds.

Opposition was voiced in the report to the Train Length Bill, passed by the Senate, as decreasing the length of trains will add to the accident hazard through the necessity of operating more trains. The bill also would tend to increase the cost of transportation.

The report recommended the revision and clarification of the Anti-Trust laws, and that some provision be made through the Federal Trade Commission for advance determination of meaning and intent as regards specifically presented business practices.

Although the declared purpose of the Robinson-Patman Act to prevent unlawful and unfair price discrimination was approved by the committee, the means adopted to achieve this purpose were questioned.

Objection was made to the Wheeler bill on anti-basing point legislation. The new Patman bill to divorce manufacturing from retailing is opposed by the crushed stone industry because 93 percent of the crushed stone is sold directly to the consumer, and to insert a middleman into the transaction would add to the ultimate cost. In the matter of legislation of wages and hours of labor, the association went on record as opposed to the minimum wage provisions of the Walsh-Healey law as unnecessary and that the maximum hour provisions are a handicap to the industry and workers. The seasonal character of employment in the industry make it economically sound to allow an employee to work longer than the usual hours during times when demand is heavy. Objection also was raised to the National Labor Relations Act as it has caused unnecessary dissension between employers and employees, and to the bill proposing seven regional TVA's as this would constitute an invasion of private business by the federal government.

The O'Mahoney-Borah Licensing Bill, which would provide for compulsory control of industry through a system of federal licensing, was held to be particularly objectionable. This drastic bill has so many penalties that a constant threat would be held over business and industry. No business could be transacted without a license, and in case a license was denied or withdrawn a prolonged legal battle would necessitate a shut-down of office, plant and factory.

Chemists' Corner

Tests of Portland Cement to Determine UNDER-BURNING and PREHYDRATION

By THADDEUS MERRIMAN

Consulting Engineer, Board of Water Supply, City of New York

RECENT SPECIFICATIONS for the Delaware Aqueduct now under construction by the Board of Water Supply of the City of New York contain new requirements for Portland Cement. Among them is a test for the solubility of the cement in a solution of sucrose (cane sugar). This test affords a quick and ready means for determining whether (1), a cement has been so completely calcined that it will remain reasonably stable in the presence of water during the operations of mixing and placing concrete and, whether (2), it has been appreciably prehydrated either while in the form of clinker or by the addition of water during the final grinding.

This test is much more searching than the current test for "free lime." The latter merely indicates that, in the absence of water, a particular cement has been calcined to such an extent that the lime has been so combined with the other oxides as not to show more than a small percentage in the result. But it does not follow, if the free lime test value is low, that all of the lime has been completely combined because much of it may be in combination only just enough to pass the test. The sugar solubility test, on the other hand, determines whether a cement has been so thoroughly calcined that, in the presence of water, it will not immediately begin to hydrate. This is what the engineer needs to know, because the operations of mixing and placing concrete require time and all of the cement which hydrates before the concrete has been placed where the set can proceed in a quiet and orderly manner, is lost cement which, by its presence, detracts from the durability of the concrete. By the same token, the engineer is interested in securing a maximum of cementing value and this is not obtained either if the cement has been prehydrated during manufacture or if it hydrates too rapidly after the addition of water. The hydration products of such a cement are not likely to be of the best quality.

The sugar solubility test is based on the long-known fact that solutions of

EDITOR'S NOTE—Information in the following article by Mr. Merri- man serves to explain the reasons why certain tests were required to meet the new Specification for Cement, prepared by the Board of Water Supply, City of New York, and the results which were obtained with concrete made with cement manufactured to the new specification. The new specification was printed in full in **ROCK PRODUCTS**, p. 86, January, 1938.

sugar are able to dissolve much larger quantities of lime than equal volumes of water alone. When a sample of any dry cement is mixed with about seven times its weight of water and the mixture is thoroughly shaken for about two hours and then filtered, it is found that the water will contain about 0.12 per cent of lime. The water can dissolve no more than this and the solution is said to be saturated. If now sugar is added to the water and the operation repeated it will be found, in the case of one cement, that the percentage of lime is 0.20 while in the case of another it may be as high as 4.50.

It thus becomes evident that these two cements are not alike. The one gives up 22 times more lime to the solution than does the other. In chemical composition and in all of the usual tests they are essentially equal but their histories are very unlike. The first was thoroughly and completely calcined while the latter was underburned. It is thus possible to say that the observed difference in behavior under the sugar test is an index of the completeness to which the cements were burned or calcined. Burning is what makes the cement just as baking makes bread. An underbaked loaf is no better than an underburned cement.

Again, in the case of two samples from the same mill, the first yields 0.25 per cent of lime to the sugar solution while the second gives up 2.50 per cent. Here the history of the samples shows that all of the clinker was well burned but that the outdoor clinker pile was wetted by heavy rains after the cement represented

by the first sample had been ground. The observed difference is thus attributable to the prehydration resulting from the outdoor storage.

This brief discussion presents the basis of the sugar solubility test, and the manner in which it serves to disclose the two most usual shortcomings of Portland Cement (a) underburning and (b) prehydration either by the wetting of the clinker or the use of water in the final grinding process.

Poor concrete may not always be attributed to poor cement. Good aggregate and careful technique in placing and curing are always necessary, yet, no matter how much care is exercised in these respects, it is impossible to make good concrete with poor cement. On the other hand a thoroughly burned and carefully manufactured cement will make a reasonably good concrete even if it has been abused by mixing with more than an optimum of water. But no matter how good a cement may be, it is often spoiled by lack of care in storage and handling after it leaves the cement mill.

The science of cement testing has long needed a means of determining, in advance of actual use, whether the hydration products formed by a cement as it sets in concrete will be strong, hard, dense and durable so as to yield a completed mass of reasonable permanence which will not disintegrate and in which checking, cracking and the formation of laitance will be at a minimum. This quality the sugar solubility test appears to disclose within the limits of composition and alkali content which are also prescribed in the specification referred to.

The technique of the sugar solubility test is simple. No complicated or costly apparatus is needed. The necessary standard acid can be made up by any chemist or be furnished by dealers in chemical supplies. One man can readily make twelve or more determinations per day. As an aid in plant control this test is also of value in that the quality of the output can be kept under observation close up to either the kiln operation or the final grinding or both.

The sugar solubility test is described in detail in the specification of which it is a part. This specification was printed in extenso in the January, 1938, issue of *Rock Products* and need not be repeated here.

The requirements as to alkalinity and free alkali are also new and important. A limit is placed on the alkalinity of the cement solution for the purpose of protecting the concrete workers against the hazard of "cement burn" which causes many "lost time" accidents. The alkalinity of a particular cement is not, as might be supposed, always directly related to its content of free alkali. On occasion the free alkali content may be high while the alkalinity is within reasonable limits. In such cases the difference appears to be due to the greater efficiency of the gypsum in converting the alkalis, (the hydroxides of sodium and potassium) into the neutral sulphates with the precipitation of calcium hydroxide.

Ideal Cement Would Contain no Alkali

The free alkali is a measure of the total alkali content of the cement. As the alkali leaches out of concrete "efflorescence" is formed and the surfaces are corroded. More importantly, however, an excess of alkali tends to prevent the formation of the strong, dense and amorphous constituent which makes for durable concrete. This is true because the more alkali present in the solution in which the early set occurs the more calcium hydrate will be formed. This hydrate is readily soluble in water and is the least desirable of the hydration products. The ideal Portland cement would contain no alkali.

The sugar solubility test has now been employed with consistent and uniform results on 200,000 bbl. of cement manufactured at six different mills and has operated to insure not only high quality but also remarkable uniformity. These results, however, are not due to the test *per se* but to the prescribed control of the manufacturing operations. Without such control the efficiency of no test could ever be determined. What the test does, is to check the operations.

All of the concrete made during the past year with cement manufactured under this specification has been of a high order of excellence. It has shown no signs of checking, crazing or cracking while laitance, even in lifts up to 20 ft. in height, has, for every practical purpose, been entirely eliminated. All of this concrete has shown ample strength in compression tests and has not developed excessive heat while setting. The hydration products are strong, dense and rock-like in appearance and the "amorphous constituent," always found in concrete of proven durability, is highly developed in all specimens.

In addition to making concrete of the quality above stated, the cement itself, manufactured at six different mills and produced during 12 different burning periods aggregating a total of 7300 individual kiln hours, has all been of the highest quality and so consistently uniform that every bag was essentially like every other. On the basis of his experience, the writer ventures to say, that no such result has, heretofore, been attained, and, when it is noted that no increase in cost was involved, both the industry and the consumer appear to have benefitted alike.

The studies on which this specification is based were made under the direction of the writer in the laboratory of the Board of Water Supply from 1911 to

date. This research was initiated and fostered by the late J. Waldo Smith, then chief engineer, who said, "We must find out why so much concrete proves to be disappointing." Walter E. Spear is now chief engineer and Charles M. Clark, deputy chief engineer, with the writer as consulting engineer. For many years the laboratory was in charge of L. B. Stebbins, assistant engineer, who retired in 1931. N. T. Stadtfeld, assistant engineer, is now in immediate charge. The analytical side of the studies was conducted by Richard H. Gaines, deceased and by Nathan Goodman and Martin Schoen, chemists. The physical testing has been supervised by W. E. Bettels, inspector.

Digest of Foreign Literature

By F. O. ANDEREGG,

Consulting Specialist in Building Materials, Newark, Ohio

Methods of Testing German Road Cements.—A great deal of work has been done in Germany to develop proper specifications for the cements to be used in their imperial *Autobahnen*, and O. Graf presents a progress report asking for comment. The cement is mixed with two parts of standard sand and one part of fine sand and with 0.6 water by weight. The mixture should have a flow from 85 to 95, but if it is less than 80 or more than 100, the amount of water must be varied. The cement is first mixed with the fine sand until uniform. Then the standard sand is added and mixed. Add the water and mix one minute by hand, after which the mortar is placed in the standard mortar mixer and given 20 turns. All mortar is removed from the mixer using a rubber scraper. To make three prisms 4x4x16 cm. requires 450 gr. cement. Each form is filled in two layers of 310 gr. mortar, the excess being left on for the first two hours storage in the damp closet and then screeded off.

Some of the prisms are removed from water storage at the end of the first week and are stored dry in tight tin boxes. Specimens are first broken in flexure using a span of 10 cm. and the fragments may then be broken in compression. Those prisms intended for volume change measurements have suitable inserts and are allowed to remain in the damp closet for two days before stripping, after which they go into water for five days. They are then weighed and measured and stored in tight boxes, each specimen in its own box. The unique proposal is made to store all specimens in supersaturated potassium carbonate made by placing 200 gr. anhydrous salt in each box and covering with 150 cc. saturated solution. This must be

allowed to cool and must be renewed after 28 and 56 days. Measurements are made after such storage and also after 90 days. *Zement* (1937) 26, No. 26, p. 422.

Coefficient of Expansion of Concrete Made from Different Cements.—This question has been carefully studied by A. Gutmann, who has been unable to determine any significant differences among the usual commercial cements when made into concrete, using about 6 bags to the cubic yard. The coefficient for old concrete runs about 0.0000067, while younger concrete may reach a value as great as 0.0000087. The aggregate has considerable influence, the above values being obtained with Rhine aggregates. *Zement* (1937) 26, No. 37, p. 614.

Impermeability in Concrete and Masonry — The term, "impermeability," usually refers to the relative degree, rather than to absolute prevention of the passage of all moisture, desirable as the latter would be in many cases. Certain methods of making concrete are well known to decrease the permeability to moisture, among which is the addition of more cement. This addition, however, leads to greater brittleness and to cracking as the concrete shrinks or settles. To fill the superficial pores of the concrete is economical but such treatments are usually only temporary and are only partially effective. The best method is a layer an inch or two thick of bituminous material, especially if a sheet of aluminum foil can be included within the bitumen. Of course, each job has its own conditions which must be met. This subject has been discussed by J. Bolomey. *Revue des matériaux de construction et de travaux publics.* (1937) No. 330, p. 54.

HINTS AND HELPS FOR SUPERINTENDENTS

Preventing Back Slip of Conveyor Belt

A HOME-MADE BRAKING DEVICE WAS installed on the 36-in. conveyor belt, 150-ft. centers, carrying aggregate from the dry screening unit to the washing plant, in a large midwestern sand and gravel plant. This conveyor is driven through a V-belt by a 150-hp. G. E. motor located at the top pulley or discharge end of the conveyor.

At times, when the belt is heavily loaded, a fuse will blow and the motor will stop. The weight on the belt will cause it to run in the reverse direction, and the material will be dumped all over in the yard below. Sometimes as much as 8 or 10 cu. yd. will be dumped in this way; and the services of two or three men will be required for several hours to clean up the mess.

Previous to the present installation, a man would climb over the belt from the motor side to the gear side and put a plank between the gears. To improve this method, a split pulley, 16 in. in diameter with an 11-in. face width, was welded to the 3 7/16-in. drive shaft from the motor. The center of the shaft and pulley is two feet above the floor. An 8-in. channel was installed as part of the floor system and 4-in. angle sections and 3-in. x 12-in. metal plates were welded to it directly below the pulley. In the illustration to the

left is shown how the floor support was installed.

A brake-band was taken from an old Erie shovel and installed as illustrated. A 12-in. bolt, 3/4-in. in diameter was flattened out on its head end and welded to one end of the band, and the other end of the band is anchored by a bolt through the two 4-in. pieces of angle iron. An old lever control from the Erie was attached to this assembly as shown in the illustration. It is bolted at one end to the metal plates by means of a 3/4-in. bolt which acts as a hinge. The other end of the band (3-in.) is run around the pulley and bolted, as illustrated. The extra holes in the 12-in. x 3-in. plates and the two nuts on the 12-in. threaded bolt permit adjustment in the height of the lever arm.

When for some reason a fuse blows, a man steps on the lever to keep the conveyor from backing down-hill. A slotted metal piece 12-in. x 3-in. and 1/2-in. thick is bolted to an upright in such a way that after the belt is stopped the handle can be placed in one of the slots to hold the conveyor at a stop. A man is usually near the head end of this conveyor. Not only is time and labor of cleaning up saved, but the danger involved in a man climbing over the belt and inserting a board between the gear teeth is eliminated. If something should go wrong

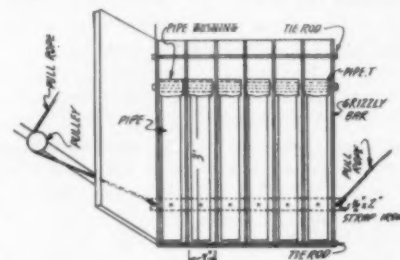
in the washing screens, the belt can be stopped almost immediately.

Device for Cleaning Grizzly

By DARE PARIS
Monrovia, Calif.

ON ONE OPERATION we had a conveyor that discharged on to the grizzly from the side instead of the end. This arrangement caused the rock to wedge between the bars requiring one man's attention about two-thirds of the time to keep them clean.

In the accompanying illustration is shown a grizzly installed to overcome this trouble, and do away with the extra labor required to clear the bars. The grizzly is equipped with a series of 2-in. pipes arranged to swing between the



Pipes, arranged to swing between grizzly bar by means of pulley and rope, remove rocks grizzly bars, the entire assembly being operated by the hoist man pulling a rope. The rope should be attached to each side to give an even pull.

When the rope is pulled the pipes swing up between the bars knocking out the rocks. One or two pulls about every 15 or 20 min. are all that is required, for the grizzly is all cleaned at one stroke. This device has proven entirely satisfactory, and relieves the necessity of an extra man.

Convenient Protection for Power Cable

By ROSS WHEELTON
Aldershot, Ont., Can.

AT ONE OF THE LOCAL QUARRIES, an electric cable is in use for blasting and for lighting night operations. As the equipment shed is at some distance from the operations; and it was not considered desirable to disconnect the cable every time after using, it was often left out in the weather. The hot sun deteriorated the rubber covering so a convenient means of protection was sought. This was provided in the manner shown in the illustration. A wooden box covered with roofing material was constructed,



Left: Brake devised from an old split pulley welded to drive shaft on conveyor. Right: Lever to actuate brake band and slotted steel plate to hold brake lever

inside of which was provided a wood peg on which the coiled cable could be hung. The cable box was fastened to the lower part of the power pole adjacent to the switch box, thereby allowing the cable to be left connected at all times ready for service. A door was provided (not shown) for the front of the cable box. At times this cable is not in use for considerable periods, and when



Weather-proofed box prevents deterioration of rubber covered power cable

coiled in the box it is adequately protected. The saving in cable deterioration more than offsets the trouble of providing this simple housing.

Air Operated Bin Gate

By WALTER B. LENHART
Bishop Creek, Calif.

WHERE SKIPS ARE USED for hoisting rock, it is often convenient to have two bins serving each skip and use a butterfly-type gate to control the discharge to a desired bin. A common way of changing the position of the gate is by means of ropes, pulleys, etc.



Compressed air engine made from steam chest of piston-type water pump operates bin gates

At a western operation the steam chest from an old piston type water pump was arranged so that compressed air could be used to actuate the movement of the gate.

The valves for controlling the gate are located near the hoist man's station, where he can divert the flow of rock as

desired. The illustration shows how the piston was mounted to function properly, and it will be noted that the gate-bin rod connects with a shoe that rides a true, horizontal surface. This gives greater stability and a freedom of motion that would not be otherwise possible had the gate-rod been connected with the piston rod directly.

Cooling Air Compressor

BELMONT TRAP ROCK CO., INC., Staunton, N. J., has no water supply of its own at its limestone plant and therefore has found it necessary to purchase city water for all uses. Consequently, every gallon of water saved represents a real economy to the owners.

One place where the consumption of water has been materially reduced is the cooling system for a Sullivan 9 x 8 air compressor. For some time cooling water at city pressure was circulated around the cylinders and then wasted, but a material saving has been effected by reusing this water, the actual water used being reduced to the small amount lost by evaporation.

A 55-gal. used oil drum has been set on the roof of the compressor house, directly above the compressor. Water enters the circulating system of the compressor by gravity from the tank above through a 3/4-in. vertical pipe. Sufficient pressure remains to raise the water a foot or two in the vertical return pipe after passing through the air compressor cooling system.

Air pressure from the compressed air tank (95 p.s.i.) is used to help push the water back to the tank above. A 1/4-in.

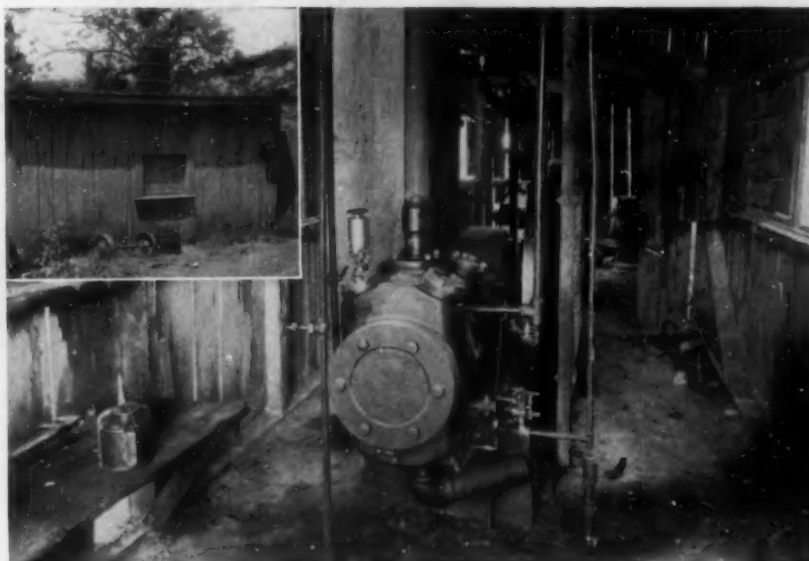
diameter pipe has been connected from the tank to the water pipe, near the connection to the compressor cylinder wall. A hand valve, when opened slightly, permits a small amount of air under pressure to back up into the water pipe, and the water is forced up into the 55-gal. drum where it can be re-used. Generally, about 5 or 6 gal. of water evaporates each week. A 3/4-in. diameter pipe, connected to the city water supply, runs to the drum, and by a turn of the hand valve the evaporated water is replaced. This simple contrivance has saved \$20 on the monthly water bill of the plant.

Safe Practices In Handling Acetylene

PROPER AND SAFE PRACTICES demand that oxygen and acetylene gauges be attached directly to their respective cylinder valves. In the case of an oxygen regulator, it will be appreciated that the regulator should not be connected to the cylinder valve by a length of hose as it would subject the hose and connections to full cylinder pressure which is in the neighborhood of 2000 p.s.i.

Good practices forbid the use of acetylene at pressures in excess of 15 p.s.i. which also means that the regulator should be attached directly to the cylinder valve so that the space in which free acetylene does exist at pressures in excess of 15 p.s.i. is reduced to a minimum. Free acetylene when subjected to pressure much in excess of 15 p.s.i. may dissociate violently.

There should be no connection between the oxygen supply and the acetylene supply except through a blowpipe or other proper consuming device.



Air compressor having a recirculating water cooling system. Inset, to the left, shows 55-gal. drum of water on roof, connected by pipes to compressor cooling system

Volume of Ready-Mixed Concrete Business at High Level

PLANT CAPACITY INCREASING

THE CONVENTION of the National Ready Mixed Concrete Association was conducted simultaneously with that of the National Sand and Gravel Association, the two associations participated in all matters of mutual interest, including entertainment.

Speakers asked to report on business conditions in the ready-mixed concrete industry were those who commented on conditions in the sand and gravel industry. Some of these members reported on one industry or the other, and others reported similar conditions for both industries. Mr. Ahearn's remarks concluding the open forum for the sand and gravel industries, in general, apply to the ready-mixed concrete industry with few exceptions.

The volume of business done by ready-mixed concrete operators in 1937 equalled the volume in 1936 over the country as a whole, said Mr. Ahearn, with about the same price level. Volume of demand to capacity exceeded that for sand and gravel considerably. This ratio was about 50 percent for the sand and gravel industry.

Joseph H. Dixey, reporting for Metropolitan New York, said there was a decline of 20 percent in production and that 1938 prospects are uncertain and unlikely to show an increase in business over 1937. Prices declined late in 1937 and are difficult to forecast for 1938, said Mr. Dixey. Volume of demand to capacity was about 50 percent, with engineering construction providing the greatest demand.

Paul Bird's report for the New England states closely paralleled his report for the sand and gravel industry with one notable exception. The ready mixed concrete plants were operated to 70 percent of capacity.

R. C. Collins, Philadelphia, Penn., said that sales from three large central mixed concrete plants increased 19 percent and that a decline of 10 to 20 percent is expected in 1938.

In Washington, D. C., E. S. Simpson said that there had been a slight decline in volume of business in 1937, with an estimated output of 450,000 cu. yd. The volume of business in 1938 is dependent largely on how much government building will take place. One of the projects under consideration alone should utilize 200,000 cu. yd. of concrete. Mr. Simpson said that on these large projects, prices are so low that it is very difficult to make a profit,

but that on the whole prices were slightly higher than in 1936. The volume of demand has nearly equalled plant capacity for the last few years. Normally 40 to 50 percent of the production is used in government building construction.

E. J. Nunan, Buffalo, N. Y., reported that the ready-mixed concrete business in western New York closely paralleled that of sand and gravel. However, there was a slight increase in prices and demand was a good percentage of available plant capacity.

For metropolitan Pittsburgh, Ray V. Warren reported an increase in volume of 25 percent and predicted a further increase in 1938. Increases in prices ranged from 50c to 80c per cubic yard and will likely go up again in 1938. At times during the year demands taxed truck capacity and operators were obliged to call upon mixer trucks from the surrounding area. Answers to other questions were covered in Mr. Warren's report for the sand and gravel industry.

A. J. O'Connor, Detroit, Mich., said that volume of commercial ready mixed concrete business had increased about 10 percent in Detroit in 1937 and would likely show a decline in 1938. The price level fluctuated somewhat, but averaged about the same as in 1936, and the volume of demand represented about 70 percent of plant capacity. Private work will likely continue to consume the bulk of production.

In the St. Louis area, H. F. Thomson said that there had been a decline of about 15 percent in volume of business in 1937 and that 1938 is not encouraging, at least for the first six months. The price level had increased proportionate to increased costs and will likely remain stable in 1938. Demand took about 50 percent of the plant capacity, and 60 percent of the production was taken by public works. In 1938 private construction will likely create 60 percent of the demand for ready mixed concrete.

Volume of ready mixed concrete sold in New Orleans was good and just about took the total plant capacity, said Herbert Jahncke. Additional equipment had to be purchased to meet peak demands and there is outlook for still better business in 1938.

J. L. Shiely, St. Paul, Minn., reported that the ready mixed concrete business in his territory was only 50 percent that of 1936 and that a further decrease

is expected for 1938. Prices increased 3 percent, but will go down in 1938. Only 30 percent of plant capacity was needed to meet demands and most of the concrete was used in public works.

Committee's Report on Truck Mixer Standards

CONSIDERABLE TIME at the 8th annual convention of the National Ready-Mixed Concrete Association was taken up in the consideration of tentative standards and recommended practices for truck mixers and agitators of the revolving drum type and the open top revolving blade type.

Lion Gardiner, The Jaeger Machine Co., Columbus, Ohio, in submitting his report on truck mixers of the first type, said that the committee had considered it advisable to incorporate in the specifications that "mixing time shall start after all ingredients, including water, are in the drum."

In order that operators may assist the committee in its final recommendations, an opportunity is being given operators to present an alternative means of providing a method of determining the start of the mixing period. The committee is continuing its study of drum speeds and the number of revolutions required for adequate mixing and will later report on its findings.

A committee was appointed on June 23 to make a similar study for truck mixers and agitators with open top, revolving blade construction. This committee is made up of F. H. Fleming, Concrete Transport Mixer Co., Inc., St. Louis, Mo.; Herbert Jahncke, Jahncke Service, Inc., New Orleans, La.; R. F. Powell, Fred Schmitt Material Co., St. Louis, Mo.; D. B. Thornton, Cromer and Thornton, Inc., Atlanta, Ga.; R. B. Young, Ready-Mix Concrete, Ltd., Montreal, Canada; and Stanton Walker, chairman.

Mr. Fleming had prepared a draft of tentative standards and recommended practices covering that type of equipment for the consideration of the committee, and this draft was adopted as the recommendation of the special committee. Mr. Fleming also compiled data pertaining to the efficiency of the revolving blade type of equipment as a concrete mixer and agitator, which was presented to the convention

LIME PRODUCERS' FORUM

Conducted by Victor J. Azbe, Contributing Editor, St. Louis, Mo.

Some Interesting Lime Plant Practices

ILLUSTRATED BELOW are views taken at various lime plants in the United States and Canada. These views serve to show how these companies have solved some problems involved in the production of lime, and also certain practices which should be avoided.

Two of the views illustrate modern equipment for handling stone up an incline; the facilities of the North American Cement Corp., Berkley, W. Va., for bringing six cars of stone up the incline at one time; and the location of the track switch far up the in-

From time to time the EDITOR of the LIME PRODUCERS' FORUM will reproduce interesting photographs from his large collection showing construction and equipment views of various lime plants.

cline at the Moosehorn Lime Co. plant at Moosehorn, Manitoba.

Another view, of historical interest, shows the first application of CO₂, in

place of steam, to automatic gas producers at the plant of the Marblehead Lime Co., Marblehead, Ill.

Three views illustrate construction practice. One picture shows the application of insulating brick in lining new kilns; another depicts the interior of a kiln at the Lee Lime Co., Lee, Mass., showing the effect of heat in raising the arch so that it is no longer supported by the center pier; and a third view shows induced draft connections to fans in which the diameter changes too suddenly for efficient results.

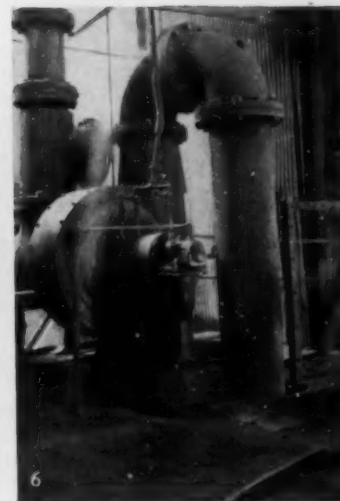


Fig. 1. Bringing six cars of stone up incline at one time. Fig. 2. Switch located on the incline track where space is limited. Fig. 3. Improperly constructed induced draft pipe connections. Fig. 4. Lining new kilns with insulating brick. Fig. 5. Hot arch raises away from pier support. Fig. 6. First application of CO₂ in place of steam, in automatic producer gas installation

RECENT DIVIDENDS ANNOUNCED

Canada Cement, pfd.	1.25	March 21
Canada Cement, pfd. (ar-		
rears)	2.00	March 21
Lehigh P. C., pfd.	1.00	April 1
Lone Star Cement, com. ....	.75	March 30
National Gypsum Co., 1st		
pfd.	1.75	April 1
National Gypsum Co., 2nd		
pfd. ....	.25	April 1

INDUSTRIAL SILICA CORP., Dundee, Ohio, reports net income of \$195,607 for the fiscal year ended December 31, equal to 91c a share on 107,216 common shares after dividend requirement on 15,000 shares of 6½ percent preferred stock, compared with \$169,631, or 67c a common share, in 1936.

Working capital increased during 1937 from \$148,495 to \$153,897. Current assets as of December 31, 1937, were \$192,181, and current liabilities \$32,284, against current assets of \$211,361 and current liabilities of \$62,867 as of December 31, 1936.

Funded debt was reduced \$200,000 during 1937 to \$500,000. No dividends have been paid on the preferred stock since 1930, arrears as of December 31, 1937, amounting to \$49.30 a share. The annual report to stockholders states that a plan of recapitalization for the possible refunding of debt has been under consideration, and studies were made during the year to determine what could be done, but the plan has been delayed awaiting a more favorable market for securities.

PACIFIC COAST AGGREGATES, INC., San Francisco, Calif., reports for the 3 mos. and 9 mos. ended Sept. 30, 1937:

3 mos. ending September 30:		
	1937	1936
Sales revenue	\$283,221	\$389,605
Costs and operating expense	192,446	262,925
Selling and administrative expense	44,287	40,266
Depletion	5,960	5,518
Depreciation	39,456	36,420
Operating profit	1,072	44,476
Other income (net)	16,051	6,707
Subsidiaries profit	6,153	690
Total income	23,276	51,873
Other deductions (net)	13,778	5,931
Net income	9,498	*45,941
9 mos. ending September 30:		
Sales revenue	\$964,542	\$864,177
Costs and operating expense	686,485	602,354
Selling and administrative expense	130,364	114,098
Depletion	19,005	15,512
Depreciation	115,978	106,269
Operating profit	12,710	25,944
Other income (net)	34,465	21,275
Subsidiaries profit	23,580	(d)7,922
Total income	70,755	39,297
Other deductions (net)	22,268	18,284
Net income:		
April quarter	(d)50,225	(d)42,273
July quarter	89,214	17,343
October quarter	9,498	45,941
9 months		
Earned per share (554,587 shares):	\$48.487	\$21.011
April quarter	(d)\$0.09	(d)\$0.07
July quarter .....	.016	.003
October quarter .....	.002	.008
9 months		
	\$0.09	\$0.04

*Does not give effect to entries adjusting company's investment in Kern Rock Co., Ltd.

GIANT PORTLAND CEMENT CO., Philadelphia, Penn., reported for the year ended December 31, 1937, a net profit of \$44,409 after depreciation, federal and state income taxes, federal surtax on undistributed profits, and other charges, equal to \$1.36 a share (par \$50) on 32,548 shares of 7 percent preferred stock on which there are accumulated dividends amounting to \$23.50 a share at close of 1937.

This compares with net profit of \$55,757 or \$1.71 a share on 7 percent preferred stock in preceding year.

CONSOLIDATED ROCK PRODUCTS CORP., Los Angeles, Calif., reports for the eight months ended August 31:

	1937	1936
Gross income	\$2,337,822	\$1,728,395
Costs and expenses	2,165,589	1,593,548
*Depletion and depreciation	114,129	191,129
Operating profit	58,104	(d)56,282
Subsidiary bond interest	120,933	120,937
Bond discount and expense	9,806	10,260
Net loss	72,635	187,479

*Decrease in depreciation charge in 1937 compared with 1936 due to fact that certain plants and equipment were fully depreciated during 1936.

In its regular monthly statement to the federal court, the corporation reported for the 11 months ended November 30, 1937, net loss of \$72,142 after provision for bond interest, depreciation and amortization. This compares with net loss of \$217,509 reported for the corresponding 1936 period.

Gross sales for the period aggregated \$3,133,456, against \$2,580,144 in the like 1936 period, an increase of \$553,312.

Provision for bond interest in the first 11 months of 1937 totaled \$166,283 and depreciation and amortization provisions \$173,209. Total current assets on November 30, 1937, were listed at \$756,901, of which \$256,924 was cash, while current liabilities amounted to \$373,614, a ratio of about 2.8 to 1.

NORTH AMERICAN CEMENT CORP., Albany, N. Y., reported for the year ended December 31, 1937, a net loss of \$580,212 after taxes, interest, depreciation, depletion, and other deductions, comparing with a net loss of \$269,038 in 1936.

Profit arising from the purchase, at less than their face amounts, of bonds and debentures in 1937 amounting to \$281,576 was credited to the surplus account.

Current assets as of December 31, 1937, including \$682,649 cash, amounted to \$1,485,525 and current liabilities were \$103,691 comparing with cash of \$930,922, current assets of \$1,572,624 and current liabilities of \$86,923 at end of preceding year. Inventories were \$673,523 against \$552,804.

Total assets of North American Cement Corp., as of December 31, last, were \$10,599,914 compared with \$11,168,955 at close of 1936. Capital surplus was \$6,150,229 and deficit from operations was \$1,308,419 compared with capital surplus of \$6,150,229 and deficit from operations of \$1,009,783 on December 31, 1936.

Capital stock consists of 82,836 shares (par \$1) of Series A convertible prior preference, 50,720 shares (par \$1) of Series B convertible prior preference, 9,086 shares (par \$1) of preferred and 18,891 shares (par \$1) of Class A common stock. Funded debt amounted to \$4,464,925 against \$4,870,225 at close of 1936.

LONE STAR CEMENT CO., New York City, has made a preliminary report for quarter ended December 31, 1937, subject to audit and adjustments, showing a net profit of \$782,999 after depreciation, depletion, interest, amortization, reserves for income taxes and contingencies, etc., equivalent to 81c a share on 961,395 shares of capital stock. This compares with \$841,382 or 88c a share on 956,535 shares of December quarter of 1936.

Report for year ended December 31, 1937, subject to audit and adjustments, shows net income was \$3,913,625 after above deductions, equal to \$4.07 a share on 961,395 shares of capital stock, comparing with \$2,892,717 or \$3.02 a share on 956,535 shares in 1936.

No provision was made for federal surtax on undistributed profits.

Income account for quarter ended December 31, 1937, compares as follows:

	1937	1936
Sales	\$4,876,751	\$4,988,739
Costs and expenses	3,271,740	3,285,843
Profit	\$1,605,011	\$1,702,896
Other income	72,220	40,432
Total income	\$1,677,231	\$1,743,328
Interest and amortization	726	39,176
Federal income tax, etc.	209,793	263,892
Depreciation and depletion	603,206	719,615
Miscellaneous charges	80,505	*120,824
Net profit	\$782,999	\$841,382

* Credit.

Year ended December 31:		
	1937	1936
Sales	\$21,249,486	\$18,516,086
Costs and expenses	13,305,962	11,458,890
Profit	\$7,943,524	\$7,057,196
Other income	226,849	153,508
Total income	\$8,170,373	\$7,210,706
Interest and amortization	3,352	380,689
Federal income tax, etc.	884,721	795,628
Depreciation and depletion	2,735,740	2,819,219
Miscellaneous charges	632,935	322,453
Net profit	\$3,913,625	\$2,892,717

TRAFFIC and TRANSPORTATION

Proposed Rate Changes

THE FOLLOWING are the latest proposed changes in freight rates up to and including the week of February 12:

Trunk

M-3675. Slag, C. L., (See Note 3), from Low Moor, Va., to Millville, W. Va., \$1.80 per net ton in lieu of present rate \$4 per net ton, 6th class, Agent Curlett's I. C. C. A-339. Reason: Proposed rate reflects the joint Locomotive or Buckland scale for the distance increased 10c.

Sup. 1 to 36477. To amend exhibit to Rate Proposal 36477, covering rates on sand, from Ford City, Penn., to various C. F. A. and Trunk Line points, as follows:

Destination	*	†	‡	§
Alta Vista, Va.	\$3.20	\$3.40	\$3.71	544
Hopewell, Va. ....	...	...	...	474
Lynchburg, Va.	3.10	3.30	3.60	520
Pulaski, Va. ....	...	...	...	551
Roanoke, Va. ....	...	...	...	493
Richmond, Va.	2.90	3.10	3.38	450

* A—Open cars.

† B—Closed cars.

‡ C—Ground or pulverized.

§ Short line distance.

Sup. 1 to 36501. Stone chips or granules (roofing granules), C. L., min. wt. 50,000 lb., from Advance and Gladhill, Penn., and Texas and Cockeysville, Md., to Montreal, Mile End and Highlands, Que., 27c per 100 lb., in lieu of present commodity rate of 30c per 100 lb., per W. Md. Ry. I. C. C. 8429, from Advance and Glad Hill, Penn., and 6th class rate 34½c now applicable from Texas and Cockeysville, Md. Reason—Same as rate on crushed or ground slate as increased.

36518. Sand (other than ground or pulverized or naturally bonded moulding) in open top cars or in closed cars, also gravel, in open top cars without tarpaulin or other protective covering, C. L. (See Note 3), from Buffalo, N. Y., to York, Penn., and Lancaster, Penn., \$2.50 per net ton, in lieu of present 6th class rate. Reason: I. C. C. Docket 22907 scale increased 10c per net ton.

36536. Crude fluxing limestone, C. L., (See Note 3), from Pleasant Gap and Bellefonte, Penn., to Trenton, N. J., \$1.99 per gross ton, in lieu of present \$2.31 per gross ton, per P. R. R. I. C. C. 1485. Reason: Same as applicable from Martinsburg, W. Va., per B. & O. I. C. C. 22120.

36539. Blocks, building (except ornamental or decorative) made of ashes, cement, cinders, concrete, gravel, sand or slag (not reinforced with metal), except enameled, individual blocks not being packed, in straight or mixed C. L., min. wt. 60,000 lb., from Springdale, Penn., to Linn, Penn., \$1.85, and to Connelville and Republic, Penn., \$2 per net ton, in lieu of present 6th class.

36540. Cement clinkers, C. L., (See Note 1), from York, Penn., to Paris, Ont., \$4.20 per net ton, in lieu of present combinations. Reason: Comparable to present rate to Montreal, Que.

Sup. 1 to 36516. Pyrites cinders, C. L., (See Note 3), from Baltimore, Md., \$2.28 per gross ton, Chester, Penn., Marcus Hook, Penn., and Wilmington, Del., \$2.43, to Lynchburg, Va., in lieu of present 6th class, per Curlett's I. C. C. A334 and A337. Reason: Same as proposed to Reusens, Va.

36545. Sand, building in open top equipment, C. L., and gravel, (See Note 3), from Quail Run, N. J., to Jersey City, N. J., 90c; Newark, N. J., 80c; Elizabeth, N. J., 70c; Plainfield, N. J., 90c and Somerville, \$1.04 per net ton, in lieu of present rates, per C. N. J. I. C. C. G4725. Reason: To restore rates that were canceled July 1, 1935.

36567. Sand (other than ground or pul-

verized or naturally bonded moulding), in open top cars, without tarpaulin or other protective covering, C. L., (See Note 3), from Cleveland, N. Y., to Camden, N. Y., 95c per net ton, in lieu of present \$2.20 per net ton. Reason: Based on Locomotive-Buckland scale, including increases.

Central

Sup. 1 to W. D. A. 53420. Withdrawal notice. White Docket Advice 53420, Docket Bulletin 2889, dated Dec. 23, 1937, covering proposal to cancel present rates on sand (except industrial) and gravel, applicable only in open top cars, from Marion, Ind., to Bluffton, Buckeye, Craigville, Decatur, Greentown, Herbst, Kokomo, Landess, Liberty Centre, Peterson, Pleasant Mills, Roseburg, Sims, Sycamore, Van Buren, Vermont, Warren, Ind., and Willshire, O., is hereby withdrawn from the docket.

53529. To establish on dolomite, roasted fractory dolomite, in granular form, treated or untreated, clinkered or burned to a dead state), C. L., from Nardo, O., to Omaha, Neb., and Kansas City, Mo., 590c; Denver, Pueblo and Minnequa, Colo., 1140c; Midvale, Utah, 1420c and Sand Springs, Okla., 660c per net ton.

53539. To establish on stone, fluxing, furnace or foundry, melting and refractory (unburned), in bulk, in open top cars, C. L., from Carey, O., to Toledo Dock, O., 70c per gross ton, subject to a transfer charge of 11.2c per gross ton from cars to vessels as named in C. & O. Ry. Tariff 2531-B. Route—Via C. & O. direct.

53547. To establish on slag, crushed commercial (a product of iron or steel blast or open hearth furnaces), (not including granulated slag), in open top cars, C. L., actual weight will apply from Toledo, O., to Coldwater, O., 115c per net ton.

53532. To establish on sand, naturally bonded molding, in all kinds of equipment, and sand, except naturally bonded molding; ground or pulverized sand (in closed equipment or in open top cars covered with tarpaulin or other protective covering), C. L., from Rockwood, Mich., to Montreal, Que., 430c per net ton, plus 20c per ton increase or total rate of 450c, providing proposed increase goes into effect, which is still under consideration by the executives.

53602. To establish on limestone, crushed or broken, not suitable for building purposes, in bulk, in open top cars only; from Alexandria, Ind., to Dubuque, Ia., 185c per net ton. (Reflects Ex Parte 115 increase.)

53611. To cancel present rates on common sand and gravel, in open equipment, from Fremont, O., to destinations in Ohio. Classification basis to apply in lieu thereof.

53621. To cancel present commodity rates on stone, crushed, in open top equipment, C. L., and on agri. limestone or agri. limestone screenings, C. L., from Broadway and Richwood, O., to various destinations in the state of Ohio, as published in Items 2630 to 2700 inclusive, and 3390 to 3440 inclusive, of Erie R. R. Tariff 179-C, classification basis to apply in lieu thereof.

53739. To establish on limestone, agricultural, unburnt, in bulk, in open top cars

*Note—The oil, tar and/or asphaltum not to exceed 10% by weight of the commodity shipped, the shipper to so specify on shipping orders and bills of lading.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

and screenings, agricultural limestone C. L., from Spore, O., to St. Clairsville, O., 145c per net ton.

Southern

12795. Brick, building, common, made of lime, sand and cinders or volcanic ash, from and to Ill., Ind., Iowa, Kan., etc., also points in the southwest. Amend Item 10 of Tariff 142-F by addition of brick, building, made of lime, sand and cinders or volcanic ash, subject to the same rates as other building brick named in that item, such publication not to apply in connection with 80 percent basis under Item 20 of that tariff.

15576 (Amdt. 1). This submittal, included in Docket 905, assigned for Sept. 20, 1937, hearing, amended to suggest: Lime sludge or waste, other than dry, C. L. Establish 200c net ton from Birmingham, Ala., and group to Savannah, Ga.

Amdt. 2 to 15584. This submittal, as amended, included in Dkt. 910, assigned for Oct. 25, 1937, hearing, suggesting rates on fullers earth, C. L., from Mobile, Ala., amended to change suggested rates to Columbus, Delaware and Marion, O., to 720c net ton.

16112. This submittal included in Docket 916, assigned for Dec. 6, 1937, hearing, amended to include A. N. R. R. stations named in S. F. T. B. Tariff 186-A as destinations at same rates as proposed to Port St. Joe, Fla., on lime, C. L., from Memphis, Tenn., and Ohio River crossings.

16343. Sand and gravel, C. L. Establish 80c net ton from Whigman, Ala., to Meridian, Miss.

16350. Lime, C. L. Revise rates from N. & W. Ry. and Virginian Ry. lime kiln west of Roanoke, Va. (other than Plasterco and Saltville, Va.), to Johnson City, Tenn., Marion, Thermal City, Forest City, N. C., and Spartanburg S. C., for Clinchfield R. R. delivery to be the same as rates now applicable for other deliveries, with corresponding revisions at local stations on the Clinchfield R. R.

16351. Gravel, C. L. Establish rates from Tuskegee, Ala., to Brunswick, Ga., Savannah, Ga., and Jacksonville Fla., made 30c net ton less than the normal rates (without the 10c per ton increase authorized under Ex Parte 115). Water competitive. Expires June 30, 1938.

16377. Gravel, C. L. Establish from Bunker Hill, N. C., to Hemp, N. C., 80c, and to Seagrove, N. C., 90c net ton. (Intrastate.) Truck competitive. Expires June 30, 1938.

16286. Fullers earth, C. L. Min. 50,000 lb. Establish 286c net ton—Attapulugus, Ga., Jamieson, Midway and Quincy, Fla., to Panama City, Fla., for export, also transshipment to Pacific coast for coastwise movement to Texas ports. Truck competitive.

16295. Mica, wet ground, C. L., min. 40,000 lb. Establish 34c cwt.—C. C. & O. Ry. stations in N. C., to Charleston, S. C., and Savannah, Ga., for export. Not applicable to shipside.

Western

E-41-241. Limestone, ground, C. L., min. wt. 40,000 lb. From Omaha, Neb., to Cedarhurst, Chetek, Ellsworth, Elmwood, Hannibal, Hustler, Menomonic, Mondovi and Park Falls, Wis. Proposed—17.5c per 100 lb.

New England

43578 (12-AR). To revise commodity rates on crude or ground feldspar, min. wt. 60,000 lb., published in Items 441-B and 445 of B. & M. I. C. C. A2955, Item 145 of B. & M. I. C. C. A-2956, Item 365 of G. T. I. C. C. 288, and Item 2720-A of Agent Van Ummeren's I. C. C. 311, from Bath, Bates, Bethel, Cathance, Dunns, Littlefield and Topsham, Me., and Cold River, N. H., to points in T. L. A. and C. F. A. territories.

Illinois

8537. Crushed stone, C. L., (See Note 1), from Chicago district to North Chicago and Waukegan, Ill. Present—Various. Proposed—85c per ton.

NATIONAL ASSOCIATION *Activities*

Lime

PRESIDENT S. WALTER STAUFFER of the National Lime Association, has announced that the Board of Directors and Executive Committee of the Association at their meeting on January 10 and 11 decided to schedule the 1938 Convention of the lime industry at the Netherland Plaza Hotel in Cincinnati, Ohio, on May 9, 10, and 11. The second day, May 10, will be devoted entirely to papers and discussion on operating problems of the industry. This is in accordance with the vote of the industry on the questionnaire sent out immediately following the 1937 Convention in Chicago.

The Kentucky Derby will be held at Louisville on May 7 and for the convenience of those who have expressed a desire to take in this event prior to the convention, a block of rooms has been reserved at the Netherland Plaza for the evening of May 7. Golf privileges at one of the Cincinnati clubs will be available on Sunday, May 8, for those who may desire to enjoy this feature.

Paul Sunderland, general superintendent, Ash Grove Lime & Portland Cement Co., Kansas City, Mo., has been elected a director of the National Lime Association for District 12, succeeding John F. Pollock, who, after 45 years' service with the Ash Grove company, has retired from business life. He had been a director and active in the National Lime Association and its predecessors for many years, and the Board of Directors and Executive Committee prepared a heartfelt resolution expressing their appreciation of his faithful service and cheerful helpfulness at all times.

Industrial Sand

EXECUTIVE SECRETARY, V. P. Ahearn, of the National Industrial Sand Association, in pursuing his contacts with those authorities which are promoting silicosis regulations, has been reelected a trustee of the Air Hygiene Foundation of America, Inc., Pittsburgh, Penn., and a member of the Advisory Committee of the New York State Labor Department. At the conference on silicosis called last year by Secretary Perkins of the United States Department of Labor Mr. Ahearn served as chairman of the Committee for the Study of the

Coming Events

NATIONAL Lime Association will hold its annual convention at the Netherland-Plaza hotel, Cincinnati, Ohio, May 9, 10 and 11.

AERICAN Society for Testing Materials, annual meeting at Atlantic City, N. J., Chalfonte-Haddon Hall hotel, June 27 to July 1.

Economic, Legal and Insurance Phases of the Silicosis Problem.

A brief and exhibit-protesting application of the proposed 15 percent increase in freight rates on industrial sand under Ex Parte 123 was presented at a hearing before the I. C. C. in Washington in January. In the brief presented by Executive Secretary Ahearn the effect of the present mileage scale in promoting new plants with subsequent loss of tonnage to the railways was explained; also the declining value of industrial sand. Objection was made to the percentage form of rate increase because this also tends to disrupt old-existing competitive relationships. Further, it was submitted that there should be no change in the relationship as between shipments of sand in box cars and naturally bonded molding sand on the one hand, and shipments in open-top cars on the other.

Sand and Gravel, Stone and Slag

THE THREE national associations in the mineral aggregate field, crushed stone, sand and gravel, and slag are associated again in a joint case to prevent, if possible, imposition of the 15 percent freight-rate increase asked by the railways in Ex Parte 123.

A brief and accompanying exhibit in the form of tables and charts showing production of aggregates and their movement by rail and otherwise was presented at the recent I. C. C. hearings in Washington, D. C., by V. P. Ahearn, executive secretary of the National Sand and Gravel Association. Aid was also given to members of the three associations in presenting their

arguments at the various regional hearings of the I. C. C.

The brief prepared for presentation to the I. C. C. is probably the most complete study of freight rates on those commodities ever made. In its preparation and presentation Mr. Ahearn was assisted by Edwin Brooker, traffic counsel, who has prepared many cases for individual producers as well as previous cases for the mineral aggregate associations.

The data show very conclusively the great decline in railroad loading of these commodities in recent years—a fact recognized by most of the railway managements, which has resulted in many special rates designed to meet truck competition. But such relief, while it has saved considerable tonnage to the railways, is often too slow in operation and it does not take care of many possible movements of small tonnages, since special rates are usually applied for and granted only for large construction projects. Special objection is made to percentage increases in rates because this procedure disrupts existing competitive relationships.

The burden of the associations' argument is that while they fully recognize the emergency of the railway managements and the need for increased railway revenue, the increasing of freight rates on these particular commodities can only result in diverting still more tonnage away from the rails, as past experience has so fully proven.

Labor Contract Renewed

MARBLE CLIFF QUARRIES Co., Columbus, Ohio, is reported to have renewed its contract with the United Quarry Workers, a CIO affiliate. The new contract is for one year and provides for no changes in wages but does make some changes in working conditions.

Fire Loss

OLD COLONY CRUSHED STONE Co., Quincy, Mass., suffered a loss estimated at \$15,000 on February 5 when fire damaged part of its plant. The fire started in the early hours of the morning in the compressor room and machine shop.

CINCINNATI QUARRIES Co., Cincinnati, Ohio, suffered a loss estimated at \$16,000 to \$17,000 on February 10 when fire destroyed a bituminous mixing plant and garage.

New

MACHINERY & EQUIPMENT

New Model Convertible Shovel

BUCYRUS-ERIE Co., South Milwaukee, Wis., has developed another modern power shovel, convertible to dragline, clamshell, crane, or dragshovel. This new machine, known as the 29-B, is a 1-cu. yd. excavator embodying many of the new engineering features built into the recently announced 33-B, 1 1/4-cu. yd. shovel.

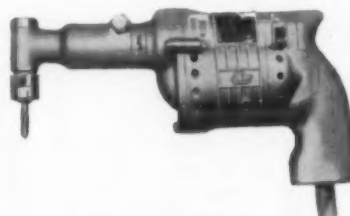
The 29-B is equipped with the new Bucyrus-Erie speed-type cast V-front, welded dipper; strong, light, it is easy filling, quick dumping. The patented inserted teeth are of long wearing, forged tool steel, quickly reversed, resharpened, or replaced. A simple, positive action power dipper trip is standard equipment. Reinforcing diaphragms are welded into the light, all-welded boom. Strong, wide-spaced, outside handles hold the dipper firmly into digging. The twin, full circle, live sheaves are 36 in. in diameter.

Other important features engineered into this machine include, single shaft drive cats giving powerful traction, facilitating easy climbing with quick, accurate steering and allowing short or gradual turns. Swing gears and trans-

A fast, worm drive boom-hoist is standard equipment and a special independent high speed power up and power down live boom-hoist is also available. Gasoline, Diesel, or electric power is delivered through a straight line transmission with gears enclosed and running in oil.

Right Angle Drill For Limited Working Clearance

INDEPENDENT PNEUMATIC TOOL Co., Chicago, Ill., has announced the new Thor U14R, 3/16 in. and 1/4 in. capacity,



Portable electric drill designed for operation in places formerly inaccessible

right-angle portable electric drill, which has just come out of the company's Aurora plant. The drill head on this new

possible to drill in places formerly inaccessible.

Equipped with a 1/16-in., 3/32-in., 1/8-in., 5/32-in. and 3/16-in. collets for twist drills the new drill offers a wide drilling range. It can also be supplied with a spindle to take a 3/16-in. chuck. Spindle offset is 13/32-in. The U14R operates at a speed of 2700 r.p.m. It can also be furnished with speeds of 3750 r.p.m. (U13R) and 5100 r.p.m. (U15R). Construction features include: a triple-insulated hand-wound armature, a commutator built on a brass sleeve to eliminate high bars and floating segments, alloy-steel, spiral helical gears and radial vent cooling system. It weighs 3 lb. and is 9 1/4-in. overall in size.

Batteries for Diesel Starting

B. F. GOODRICH Co., Akron, Ohio, has announced a complete line of specially constructed batteries for Diesel starting service. In the line are four 6-volt types, two 8-volt types and ten 12-volt types. Eight of the batteries are of conventional construction and eight built with the Kathanode construction. Port Orford cedar is used for the separators which are of the conventional type. In the Kathanode type, flexible spun glass Kathanode retainer mats are used on both sides of the positive plates, holding the active materials adjacent to them for a longer period, and thus increasing battery life.

The new line of Diesel batteries, according to the manufacturer, are built with thinner plates than heavy duty types, giving instant reaction and quick motor turnover. Adequate power is available instantaneously to ignite the fuel oil and start the motor in coldest weather. All batteries, except the 8-volt types, are assembled in hard rubber cases. The 8-volt types are assembled in hard rubber jars and wood cases. Connectors are of solid lead, except the 8-volt types, which are of flexible copper with lead coating to prevent corrosion. Cell covers are made of reinforced hard rubber, terminal posts are of the braced type, with rubber gasket seals and locknuts to prevent acid seepage, allowing for vibration of plates without causing damage. Splash proof vents are used and ample sediment space provided to prevent battery failure as a result of short circuits arising from an accumulation of sediment touching the plates.



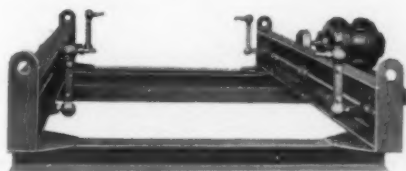
Power shovel of 1-cu. yd. capacity, convertible to dragline, clamshell, crane or dragshovel purposes, has new cast V-front welded dipper

mission boom hoist and propel are enclosed and run in oil. All high-speed shafts operate on ball or roller bearings.

unit measures only 2 1/8 in. overall, and the angle attachment can be turned and clamped into any position, making it

Vibrating Screen With Controlled Circular Motion

SCREEN EQUIPMENT CO., Buffalo, N. Y., has introduced a new and improved type of vibrating screen. The new screen, which is built with one, two or three



Vibrating mechanism of improved type of screen

decks, and in capacities up to 400 tons per hour, is said to impart vibration to the material through a positive, controlled motion, uniform at all speeds and not affected by conditions of feed or load.

The vibrating mechanism is simple in design and rugged. The entire shaft assembly is housed in a seamless steel tube, welded into steel heads which are in turn bolted to the vibrating body. All bolts in the vibrating part of the screen have self-locking nuts.

A new departure in vibrating screen design is offered in the equalizer assembly. With its introduction, the use of springs, spring plates, spring boxes and other types of resilient mountings have been eliminated. It is claimed that this patented feature gives a uniform rotating motion of the screen regardless of speed or loading conditions.

New Model Truck Has Diesel Engine

THE HUG CO., Highland, Ill., announces a new Hug Luger Model 16 equipped with a new automotive type Caterpillar Diesel engine, having a 4¼-in. bore and 5½-in. stroke. The engine will be the first of the new automotive type design series built by the Caterpillar Co.; it will have a displacement of 468 cu. in.; it will operate at conventional truck type en-

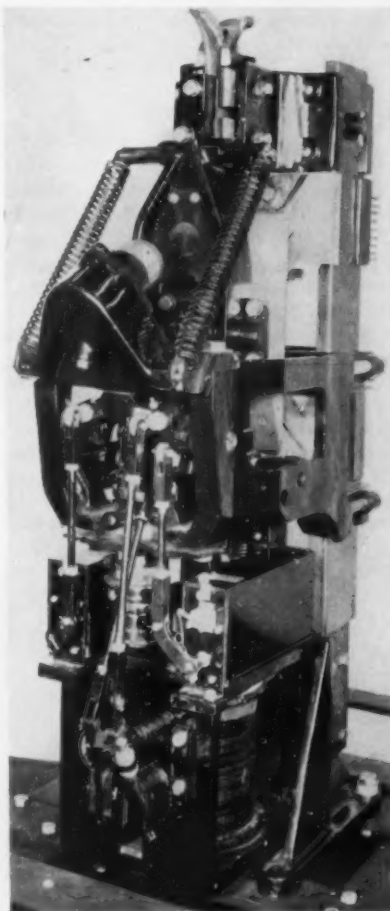


Diesel-powered tractor truck with cab-over-engine design

gine speeds; and will also have the usual type electric starting system. A special cab-over-engine designed tractor chassis with a maximum trailer payload capacity of 20,000 lb., is now available as well as the well-known 6-cu. yd. Roadbuilder model. Both models are offered with the new Diesel engine.

Heavy Duty D.C. Air Circuit Breaker

WESTINGHOUSE ELECTRIC & MANUFACTURING CO., East Pittsburgh, Penn., has developed a heavy duty d-c. air circuit breaker with contacts representing a wide departure from previous practice in circuit breakers of this type. No carbon is used and the main and auxiliary contacts are so arranged that magnetic re-



Air circuit breaker with main and auxiliary contacts arranged so that magnetic reaction at high current increases contact pressure

action at high currents increases contact pressure.

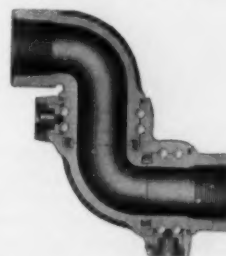
The main contacts have the stationary portions semi-flexible while the moving contact is solid. Thus any magnetic reaction set up by heavy currents forces

the stationary contacts outward against the moving contact thereby maintaining contact pressure until the breaker actually starts to open. Similar action takes place on the secondary and tertiary contacts.

The mechanism is mechanically trip-free from the closing solenoid or operating handle so that the breaker will open immediately if an attempt is made to close it against an extreme overload or short circuit. Single pole circuit breakers are available in either pedestal or panel mounted types in current rating 2000 to 10,000 amperes up to 750 volts d-c.

Ball-Bearing Swing Joint

CHIKSAN OIL TOOL CO., LTD., Fullerton, Calif., has developed a ball-bearing, all-metal swing joint which is adaptable for all installations where movement is a factor. The patented construction of this new joint provides double rows of hardened steel balls which, it is claimed,



Ball-bearing swing joint for use on slurry tanks

not only carry all radial loads, but also maintain a pre-regulated thrust load upon the packing element, keeping it always pressure-tight and leak-proof. The joint cannot bind nor get out of adjustment, and there is nothing to interfere with free and complete 360 deg. swivelling.

These joints are available, for use on slurry tanks in cement plants, steam and water lines, etc., in a wide variety of rotating actions, in steel, malleable iron, or aluminum. Sizes range from ¾-in. to 12-in. (and up to 18-in. on special order). They come in threaded, flanged or plain ends for connecting into all kinds of pipe, and are made for both high and low pressures.

GENERAL ELECTRIC CO., Schenectady, N. Y., announces that sodium lamps are now being used to safeguard men, equipment, and materials from injury and loss during night work in the yards of industrial plants. The roads, driveways, docks, parking lots, loading and receiving platforms, outdoor storage areas of an ever-increasing number of users are now lighted with the new lamps.

• NEWS • OF • THE • MONTH •

Federal Highway Aid

BEST ARGUMENT for not dropping federal aid for state highways is given by C. H. Purcell, state highway engineer of California and president of the American Association of State Highway Officials. He says: "More than \$3,500,000,000 is necessary for rebuilding and relocating highways by state departments in this country." He says further that 57,750 miles of busy roads must be rebuilt, 21,420 miles must be widened, and 19,000 miles of road relocated as shown by a survey of about 22 percent of the state highway systems.

"Obsolescence is a factor that can no more be dodged in highways than in private business," Mr. Purcell said. "Speed, increased registrations and increased car usage have combined to make the highways built 10 years ago, or more, inadequate today."

The work to correct the defective road systems would have to be spread over a five to ten year construction program, he pointed out.

"At the recent senate and house committee hearings on federal road bills," he said, "our association presented these and other facts which prove that federal road aid cannot be withdrawn or curtailed without seriously increasing unemployment and without continuing unsafe highway conditions."

Production Resumed

WASHINGTON-IDAHO LIME PRODUCTS Co., Orofino, Ida., was scheduled to resume production March 1, according to local reports, which quoted Otto C. Frei, vice-president and chemist, as follows: Satisfactory agreements have been reached between the company and the United Cement Workers' Union No. 21322, affiliated with the American Federation of Labor, and the plant will operate on a closed shop basis. Future operating personnel will be increased approximately 10 men, in addition to the 35 regularly employed, to take care of the plant's increased capacity brought about by installation of more machinery. The men will work on a 40-hour week basis in three 8-hour shifts per 24 hours.

The improvements, representing considerable additional investment, will increase capacity of the plant 35 percent over recent years, and are as follows: New clinker cooler with additional 50 percent capacity over the old one. Kiln

room equipment added for increased heat recovery from cooler. V-belt drive in grinding mills to replace flat belts. Rock storage bins in crushing department are being trussed roofed and all elevators and conveyors are being enclosed to reduce losses during the inclement weather. New slurry pumping system of greater capacity and efficiency is being installed. An additional railroad spur provides access to both sides of the pack house.

Plans are under way to install a slurry dehydrator at the feed end of the rotary kiln for removal of excess water.

The Jordan lime plant, located 3 miles up the Clearwater river from Orofino, will resume operations at the same time, Mr. Frei stated.

Change of Ownership

NATIONAL GYPSUM Co., Buffalo, N. Y., has acquired the Best Bros. Keene's Cement Co., manufacturers of crushed gypsum rock, Keene's cement, white plasters and other gypsum products. Under the terms of the transaction, 10 shares of National Gypsum common stock will be exchanged for each of the 6617 shares of Best Bros. As of January 31, last, 95% of the stock of Best Bros. had accepted the offer. Best Bros. owns in fee at and near Sun City, Kan., about 2000 acres of gypsum lands containing estimated reserves of over 30,000,000 tons of pure, white gypsum rock. In addition it has 200 adjoining acres under a lease that still has 43 years to run. Also, at Medicine Lodge, Kan., the company has a plant with an annual capacity of about 100,000 tons of all types of gypsum products.

Wins Suit

SQUAW ISLAND FREIGHT TERMINAL Co., Buffalo, N. Y., owner of Squaw Island in the Niagara River, a principal source of sand and gravel for Buffalo territory, won a damage claim against the city of Buffalo for \$312,240, plus interest since 1932. The company sought \$876,000 for damage done to its gravel property above and below water level because of sewage discharged into the river by the city.

Bankruptcy Sale

MARION SAND & GRAVEL Co., Marion, Ohio, assets were ordered sold by the county court at the request of the receiver. Miami Stone Co., Toledo, Ohio, was the only bidder, with \$12,500 offer.

Enterprise

LONG VALLEY ORE Co., Morristown, N. Y., is completing a new mill for grinding and flotation of graphite, said to be one of the most modern in the United States — having cost nearly \$300,000. Vaughn Morrill is general manager.

ARUNDEL-BROOKS CONCRETE CORP., Baltimore, Md., ready-mixed concrete manufacturer, is erecting a new plant on the Northern Central branch of the Pennsylvania R. R. in the Woodberry section, south of Jones Falls. The plant will have a capacity of 400 cu. yd. of pre-mixed concrete per day. Blaw-Knox Co. equipment is being used.

SMOOT SAND AND GRAVEL Co., Washington, D. C., is adding three steel storage tanks for cement to its water front plant at the foot of K street N. W.

KENTUCKY CONCRETE PIPE Co., Louisville, Ky., will build a \$10,000 plant at 32nd and Woodland.

NORTHWESTERN GRAVEL Co., Lake View, Ia., has amended its charter to permit it to engage in general engineering and construction of all kinds.

LOGAN SAND AND GRAVEL Co., Logan, Ohio, is a new organization, building a plant on the Westenhauer farm south of Logan. Thos. Geslin is manager.

F. T. HARRIS AND JOSEPH JOLLY, Okolona, Miss., operating under the name of Okolona Lime Plant, have built a crushing plant for limestone.

THOMPSON-WEINMAN & Co., Inc., Cartersville, Ga., have recently completed a new crushing and grinding plant between Jasper and Tate, Ga., to crush and pulverize both Georgia marble and sericite. Gordon Poster, formerly in charge of the company's plant at Sparta, Ga., is manager.

WILLIAM S. BRANTINGHAM, Ponca City, Okla., has leased 40 acres of limestone property 4 miles southeast of the city and will build a crushing plant.

MERRITT, CHAPMAN & SCOTT CORP., New York City, contractors for a breakwater extension and lighthouse at Marquette, Mich., has applied to the city authorities for permission to open a quarry on city property on Dead river.

ROCK PRODUCTS

FRONTIER BITUMINOUS MATERIALS CORP., Lockport, N. Y., has been granted a city permit to erect a \$10,000 mixing plant on property of the Pekin Stone Products Corp.

A. R. ENO, Fort Dodge, Ia., contractor will begin stripping operations this spring to uncover what is estimated to be 2,000,000 tons of gypsum. He proposes to sell the crude gypsum rock.

GROVE STONE AND SAND CO., Ashville, N. C., has announced an improvement program to cost \$45,000 to \$50,000. The improvements include a new large primary crusher and storage system.

OLD COLONY ASPHALT CONCRETE CO., Quincy, Mass., has been organized to succeed the Weymouth Asphalt Concrete Co. and the Bituminous Paving Products Co. The plant and offices will be located adjacent to the Old Colony Crushed Stone Co., and additional modern machinery is being added which will give the plant a capacity of 1500 tons per day, making it the largest asphalt mix plant in New England. All types of hot and cold mixes will be made including Amiesite, specializing on Laykold asphaltic concrete. Irving E. Johnson is vice-president in charge of operation.

PACIFIC COAST AGGREGATES, INC., San Francisco, Calif., has taken over operation of the Oakdale gravel plant of the Atlas-Olympia Co. of California, making it Plant No. 24. The Pacific Coast Aggregates, Inc., now has 26 plants in operation in the state. The change is incident to the acquisition by the Atlas-Olympia Co. of a very substantial interest in the larger concern, according to the announcements made public by A. K. Humphries, president of the Atlas-Olympia Co., and Charles M. Cadman, president of the Pacific Coast Aggregates, Inc. There will be no change in personnel at the local plant, officials stated yesterday in commenting on the change. R. B. Roberts is superintendent of the Oakdale plant, and R. L. Robinson is in charge of the ranch division of the Atlas-Olympia Co., which will preserve its entity, as the company's ranch holdings do not figure in the change.

COTTON STATES PORTLAND CEMENT CO., Jackson, Miss., a new project in the development stage, is reported to have acquired acreage in the Selma chalk deposits near Macon in Noxubee county.

ERIE SAND AND GRAVEL CO., Erie, Penn., is converting its Great Lakes freighter "Griffin" to a self-unloader.

Strike Ends

WOODVILLE LIME PRODUCTS CO., Woodville, Ohio, was tied up for two weeks by a strike called by the C. I. O. The issue involved the recent secession of the International Quarry Workers union from A. F. of L. and its affiliation with C. I. O. Another group of employees belongs to the Dolomite Workers of America, an A. F. of L. local, which did not welcome the strike.

Fatal Accident

NATIONAL LIME & STONE CO., Tiffin, Ohio, suffered a fatal accident to a plant carpenter who was handling timber with other workmen at the top of the crusher building, when his glove caught on a heavy timber as it was being thrown out of the building. He was jerked violently out and fell into the quarry, striking a cable 15 ft. from the ground. His neck and left leg were broken, and death occurred almost instantly.

Lime Causes Fire

BLUE DIAMOND CO., Malden, Mass., lime putty and lime mortar manufacturer, suffered a fire loss on January 25 of about \$8000. The fire was caused by rain water leaking into the lime storage shed. Several firemen were injured by lime burns.

Receiverships

STANDARD LIME AND STONE CO., Fond du Lac, Wis., has been placed under J. C. Stadler as receiver. The plant and quarry is operated under lease to W. A. Titus, according to local reports.

CHEMICAL LIME CO., Bellefonte, Penn., has been placed under four trustees appointed by the federal district court upon application by creditors for a reorganization under section 77-B of the federal bankruptcy act. The trustees appointed are Thomas M. Brown, Pittsburgh; H. D. Brigstocke, York; R. Spencer, Townsend and Clarence P. Wynne, Scranton. Their appointment supercedes the appointment of W. J. Emerick and Francis Crawford, as receivers, by the Centre county court. Under the appointment the receivers were required to turn over to the trustees the audit and appraisal they had made under authority of the Centre County court.

Federal Judge Watson stated in his decree his belief that the foreclosure proceedings brought by the Reconstruction Finance Corporation would have resulted in serious loss to the Chemical Lime Co.'s creditors and stockholders. Through reorganization under the bankruptcy act the company will have an op-

portunity to work itself out of its present financial difficulties.

The company was unable to meet interest payments on its loan of \$707,620 obtained from the R. F. C., and the federal lending agency started foreclosure proceedings. A quick move on the part of certain creditors of the company, however resulted in the firm being placed in receivership. At the same time three creditors filed a petition in the federal district court at Scranton asking that reorganization of the company be effected under section 77-B of the bankruptcy act.

Pushing Lime Mortar

JAHNCKE SERVICE, INC., New Orleans, La., which recently completed a new Brooks-Taylor lime putty plant, has retained the services of Norman G. Hough, former president of the National Lime Association, to do special promotional work in introducing lime mortar in New Orleans. Mr. Hough recently completed a similar service with the Richter Concrete Corp., Cincinnati, Ohio. The Jahncke Service, Inc., has already sold ready-mixed lime mortar for all the fireproofing and all the stone work for the new Charity Hospital, now under construction.

Loses Suit

UNITED STATES LIME PRODUCTS CO., San Francisco, Calif., lost a suit brought by neighboring ranchers at its Sonora, Calif., plant for alleged damages caused by lime dust to growing crops. In spite of the fact that farmers in other parts of the country buy and apply lime and limestone dust as a fertilizer and insecticide, these farmers not only got the dust free but \$1666.52 in cash as "damages" to boot!

New Plant

D. O. KIMMEL, Pine Bluff, W. Va., recently completed a new small lime plant which local newspapers say was "constructed according to government plans." The owner is a former member of the state legislature. It is expected that agricultural lime will be the principal product.

Resumes Production

NORTHWEST MAGNESITE CO., Chewelah, Wash., resumed production February 1 after a two-months' shutdown.

UNIVERSAL ATLAS CEMENT CO., Chicago, Ill., is reported to have resumed production at its Hannibal, Mo., plant March 1.

Prices Bid—Contracts Set

DENVER, COLO.: Monolith Portland Midwest Co., Denver, was awarded contract to furnish 310,000 bbl. portland cement for construction of Seminole dam at \$1.69 per bbl.

HOUSTON, TEX.: Texas Construction Material Co., Houston, has been awarded a contract to furnish the county with 600 tons of gravel at prices ranging from \$1.61 to \$1.90 a ton at various delivery points.

CINCINNATI, OHIO: Contracts for sand totaling \$28,727 have been awarded by the city. John Mueller Co. will furnish 5000 tons of lake sand at \$2.39 per ton; Reading Sand and Gravel Co., 7000 tons of sand for asphalt pavement at \$1.05 a ton and 1950 tons of sand for masonry work at \$1.05 per ton; George L. Rack, Inc., 6600 tons concrete sand at \$1 a ton; Ohio Gravel Co., 700 tons sand for oiled streets at \$1.13 per ton.

BIRMINGHAM, ALA.: City commission has awarded a contract to the Sloss-Sheffield Steel and Iron Co., Birmingham, for 3000 tons of slag screenings at 90c a ton delivered at the airport.

PALO ALTO, CALIF.: Treasury Department, Procurement division, has awarded a contract to Cowell Lime and Cement Co., San Francisco, to furnish 660 bbl. portland cement in paper sacks delivered to Palo Alto at \$2.23 per bbl.

YUBA CITY, CALIF.: Treasury Department, Procurement division, has awarded a contract to Valley Concrete Pipe Co., Chico, to deliver 2000 ft. 15-in. concrete pipe at 48c per foot.

HARTFORD, CONN.: Edward Balf Co. has a contract to furnish 18,000 tons crushed trap rock of various sizes to the city at \$2.63 per ton.

SAN FRANCISCO, CALIF.: Treasury Department, Procurement division, has awarded a contract to the Cowell Lime and Cement Co., San Francisco, for 30,000 sacks portland cement, f.o.b. cars at mill or alternate, f.o.b. cars, San Francisco. The bid price was 42c per sack.

INDIANAPOLIS, IND.: State Highway Commission has awarded contract to J. W. Karch Stone Co., Bryant, for 1000-1200 tons stone, 35 percent crushed, at 90c per ton f.o.b. Bryant; Rockledge Product Co., Portland, 1200 to 1500 tons at 90c per ton f.o.b. Portland.

MERIDIAN, MISS.: Lauderdale county has awarded sand and gravel contracts

to Waters and McCrary Gravel Co., Columbus, Columbus Gravel Co., Columbus, Fleming Gravel Co., Columbus, and a slag contract to Woodstock Slag Co., Birmingham, at prices of 80c to \$1.15 per ton f.o.b. plant.

INDIANAPOLIS, IND.: State Highway Department has awarded contracts for 1000-1200 tons crushed stone size 6 and 300-500 tons size 12 stone to Mid West Rock Products Corp. at 90c and \$1.12 per ton respectively f.o.b. plant; 700 to 1000 tons crushed stone screenings to Louisville Cement Co., Louisville, Ky., at \$1.14 per ton f.o.b. Princeton.

INDIANAPOLIS, IND.: State Highway Commission has awarded contract for 500-700 tons riprap, f.o.b. Linton, to Bedford Limestone Corp., Bedford, at \$1.31 per ton; 1500 to 2500 tons size 6 crushed gravel, 35 percent crushed, to Northern Indiana Gravel Co., Wolcottville, at \$1.25 per ton f.o.b. plant.

MODESTO, CALIF.: Modesto Irrigation District has awarded a contract to the Monolith Portland Cement Co., Los Angeles, for 4000 bbl. modified cement at \$1.91 per bbl.; 1000 bbl. standard cement to Pacific Portland Cement Co., San Francisco, at \$1.88 per bbl.

FRESNO, CALIF.: Treasury Department, Procurement division, awarded contract for 1800 sacks portland cement to Maisler Bros. Lumber Co., Fresno, at 62.5c per paper sack, delivered at the airport.

RALEIGH, N. C.: Gray Concrete Co., Thomasville, N. C., has a contract to deliver 1040 ft. of 18-in. and 24-in. reinforced concrete pipe, f.o.b. Bear Grass, and 180 ft. 18-in. reinforced concrete pipe, f.o.b. Elizabeth City, at \$1200 and \$210 respectively.

INDIANAPOLIS, IND.: State Highway Commission has awarded contract for 500-1000 tons size 6 crushed stone at \$1.49 per ton, f.o.b. Velpen, to Louisville Cement Co., Louisville, Ky., Western Indiana Gravel Co., Lafayette, and J. C. O'Connor and Sons, Inc., Fort Wayne, 100-200 tons size 14 concrete sand at 70c per ton; Quackinbush Bros., Paoli, 400-800 tons crushed stone at \$1.14 per ton delivered at state road 150; 1000-1500 tons crushed gravel size 6, f.o.b. Angola, to Northern Indiana Sand and Gravel Co., Angola, at 70c per ton; 1000 to 1400 tons size 3 crushed stone delivered to state road 21, to Pipe Creek Stone Co., Marion, at \$1.25 per ton.

TRENDS—

As Evidenced by Machinery Purchases

THE BIN-DICATOR Co., Detroit, Mich., reports recent installations of Bin-Dicators in the rock products industry as follows: Aluminum Co. of America; American Potash & Chemical Co.; Cebu Portland Cement Co.; Gulf Portland Cement Co.; Hawkeye Portland Cement Co.; Congoleum-Nairn, Inc.; Huron Portland Cement Co.; Consolidated Feldspar Co.; H. E. Millard; Moores Lime Co.; Lehigh Portland Cement Co.; National Gypsum Co.; Mountsorrel Tarred Macadam Co., Ltd., Leicester, England; Pacific Graphite Co.; Ready-Mixed Concrete Co.; Standard Mineral Co.; Universal Atlas Cement Co.

JACKSON & CHURCH Co., Saginaw, Mich., report the shipment to Block & Brick, Inc., Detroit, Mich., of a hardening cylinder 6 ft. 6 in. by 80 ft. long to stand a working pressure of 148 p.s.i. to comply with the A.S.M.E. specifications.

This company also reports that Grays Ferry Brick Co., Philadelphia, Penn., has purchased the latest type No. A 14 model brick press.

CUMMINS ENGINE Co., Columbus, Ind., announces several new installations of Diesel engine equipment: Hill Dredging Co., Atlantic City, N. J.; Farview Sand and Gravel Co., Detroit, Mich., to operate sand pump; Bolz Dredging Co., St. Louis, Mo., operates dredge sand pumps; Buffalo Sand Co., Lancaster, N. Y., dredge pump operation.

DEISTER MACHINE Co., Fort Wayne, Ind., reports the following recent installations: Negley Sand and Gravel Co., Negley, Ohio, two screens; A. E. Frosh, East Liverpool, Ohio, one 4- x 10-ft. triple-deck and one 3- x 6-ft. single deck screens; Quality Sand and Gravel Co., Wapakoneta, Ohio, two screens.

MARION STEAM SHOVEL Co., Marion, Ohio, advises that there have been several recent purchases of shovel equipment: Missouri Portland Cement Co., St. Louis, Mo., type 4121 electric shovel equipped with 3 cu.-yd. dipper at Fort Bellefontaine, Mo., quarry; Moulding Brownell Corp., placed a type 39-A dragline in operation at Cayuga, Ind., plant; the Maryland Slag Co., installed a type 4161 electric shovel at Sparrows Point, Md.; Pittsburgh Limestone Corp., New Castle, Penn., placed in operation at its Hillsville quarry a type 4161, a type 5161, also three type 361 electric tunnel shovels; Great Lakes Steel Corp., installed a type 480 electric shovel at Detroit, Mich.; Grand River Gravel Co., Ionia, Mich., operating a type 351 dragline fitted with 50-ft. boom and 1 1/4-cu.-yd. dragline bucket.

ROCK PRODUCTS

NEWS ABOUT PEOPLE

Employees Honor Richard Moyle, Sr.

RICHARD MOYLE, SR., vice-president in charge of operation of the Marquette Cement Manufacturing Co., Chicago, Ill., was recently presented by employees of the company with plans for a beautiful sun dial as a token of esteem. The sun dial is to be installed in the rock garden he completed last summer at his residence at Oglesby, Ill. John McGraw, president of the employees' union, was chairman of the committee on arrangements, and the presentation was made by John Wardinski.

The sun dial has a double base of machine-cut Wisconsin sandstone which will be placed on a pedestal that stands 4½ ft. high. The dial has been imported from Italy, a country which is noted for accuracy in dial manufacture. A bronze plaque to be placed on one side of the pedestal, will have inscribed on it the story of the presentation. In responding to the presentation address, Mr. Moyle expressed appreciation for the gift not only for its value in the sense of decorating his garden but particularly be-



Richard Moyle

cause it is evidence of the loyalty of the employees and their regard for him.

Not long ago employees of the Cape Girardeau, Mo., plant presented Mr. Moyle with a large bronze plaque on which the signatures of the employees were inscribed, as a tribute to his leadership.

PHILIP L. LEIDY has been elected secretary of the National Portland Cement Co., Philadelphia, Penn. George Rich-

ardson, formerly secretary, was elected treasurer to fill the vacancy created by the death of John D. Shibe. Mr. Leidy, a member of the law firm of Pepper, Bodine, Stokes & Schoch, has been a director of the cement company for several years.

D. S. MACBRIDE has resigned as manager of the "Incor" Division, Lone Star Cement Corp., New York, N. Y., to become vice-president of the Hercules Cement Corp., Philadelphia, Penn.

After five years with the Portland Cement association as field engineer and



D. S. MacBride

later district engineer in charge of the Philadelphia office, Mr. MacBride became associated, in 1924, with the International Cement Corp., as assistant general sales manager. While in charge of the Indiana subsidiary, International developed and marketed "Incor," said to be the first high early strength cement produced in this country.

When in 1931, "Incor" marketing was launched on a nationwide basis, backed by national advertising, he was placed in charge of "Incor" sales and advertising activities for the entire company. Mr. MacBride will direct the sales activities of the Hercules Cement Corp. from the company's Philadelphia office.

BERNARD L. McNULTY, president and general manager of the Marblehead Lime Co., Chicago, Ill., was recently elected to the Board of Trustees of Armour Institute of Technology.

R. R. LITEHISER, chief engineer of tests of the Ohio State Highway Department, has accepted the position of Director of Engineering of the New York State Crushed Stone Association, Albany, N. Y., effective March 1. During the eight years Mr. Litehiser has



© Ray Lee Jackson

R. R. Litehiser

been chief engineer of tests with the Ohio State Highway department, the test laboratory has become widely known for its research studies. He is well-known to mineral aggregate producers, and was a recent speaker at the Cincinnati conventions. Mr. Litehiser is a graduate of Massachusetts Institute of Technology.

B. E. MANLY, who has been assistant secretary of the Hawkeye Portland Cement Company for a number of years, has been appointed acting general manager, succeeding the late C. B. Condon.

WILLIAM G. PERROW, district manager of the Lehigh Portland Cement Co., at Spokane, Wash., has accepted the chairmanship of the important industrial development committee of the Washington State Federation of Commercial Organizations.

L. M. GRAHAM is the new manager of the Victor Mica Co., Spruce Pine, N. C., succeeding Orin Phelps who has left for Dallas, Tex., to become associated with the J. C. Ellis Oil Co. Mr. Graham formerly operated his own company at East Orange, N. J.

GEORGE N. SCOTT, president of the Pioneer Sand and Gravel Co., Seattle, Wash., has been elected president of the Seattle Goodwill Industries, Inc.

EARL BARNETT, superintendent of the Cowell Cement Co., at Cowell, Calif., has been named general manager, in charge of all operations at this plant. He succeeds W. H. George

President of N.C.S.A.

T. I. WESTON, Columbia, S. C., the newly elected president of the National Crushed Stone Association, is a scholar, a gentleman and an engineer. He is a graduate of that great military college—The Citadel, of Charlestown, S. C.—often called the West Point of the South



T. I. Weston

—famous for having turned out many of the officers of the Confederacy.

"Ike," as he is known to his intimates, with his Southern drawl and gentle, serene disposition, is beloved by all who know him. But he is a persistent fighter for the virtues of crushed stone and has long been one of the staunchest supporters of the Association's research program.

At home he is president and treasurer of Weston and Brooker Co., producers of crushed granite—the hardest of all rocks to crush and screen.

FREDERICK B. HUNT, for many years electrical engineer of the Nazareth Cement Co., Nazareth, Penn., and for the last two years chairman of the Cement Section of the National Safety Council, has been appointed plant manager of the Dewey Portland Cement Co., Davenport, Iowa. Mr. Hunt assumed his new duties early in the month.

B. J. WHITTAKER, district sales manager of the Universal Atlas Cement Co., Albany, N. Y., has been appointed to a similar position with headquarters at Boston. J. C. McClure has been appointed to the district sales managership at Albany, recently held by Mr. Whittaker.

R. B. FORTUIN, manager of public and industrial relations of the Pennsylvania-Dixie Cement Corp., has been appointed chairman of a sub-committee of the Portland Cement Association, which will consider the future of the P.C.A. safety trophy contest.

Only some 18 plants remain which have not won this trophy. Members of Mr. Fortuin's group include C. E. Caron,

general superintendent, Trinity Portland Cement Co.; Geo. W. John, vice-president of the Petoskey Portland Cement Co.; A. F. Krabbe, general superintendent of the Olympic Portland Cement Co.; M. O. Matthews, manager of the Oklahoma Portland Cement Co.; W. F. Murray, vice-president of the Wolverine Portland Cement Co., and J. B. Zook, chief engineer of the Great Lakes Portland Cement Corp.

WILLIAM J. MINSCH was elected a director of Lawrence Portland Cement Co., New York, N. Y., at the recent annual meeting of the company. Mr. Minsch is president of Minsch, Monell & Co., Inc.

FRANK WALLACE is the new traffic manager of the Northwestern Portland Cement Co., Seattle, Wash., effective March 1. Mr. Wallace succeeds the late Carl Werthenbach.

W. N. Fry of the Central Sand & Gravel Co., and H. W. GRAUPNER of the Marquette Cement Co., Memphis, Tenn., have been appointed members of the important Inland Waterways Committee of the Memphis Chamber of Commerce.

H. A. JOHANN, the newly elected chairman of the Manufacturers' Division of the National Crushed Stone Association, is one of the "old timers," who helped



H. A. Johann

organize the Division's first exhibits some 15 years ago. He is with the Frog Switch and Manufacturing Co. at St. Louis, Mo.

Obituaries

WILLIAM H. SMITH, one of the leaders of the slate industry in the Bangor, Penn., area, died recently at the age of 62. Mr. Smith was secretary treasurer of the Natural Slate Blackboard Co., and the North Bangor Slate Co.; president of the Bangorvein Slate Co., and president of the Pennsylvania Slate Manufacturers Association since its organization.

LINCOLN M. TINTINGER, president of the Tinting Gravel Co., of Cascade and Great Falls, Mont., passed away after an illness of five weeks.

GEORGE BENTLEY POORE, vice president and purchasing agent of the Calaveras Cement Co., San Francisco, Calif., and an internationally known mechanical engineer, died recently from a heart attack at the age of 69. Mr. Poore had been with the company since 1923.

HENRY W. HEEDY, president of the Union Limestone Co., and Newcastle Lime & Stone Co., Newcastle, Penn., died January 15 at Youngstown, Ohio, at the age of 87.

RAYMOND R. SHANK, president of the Shank and Etzler Lime Co., Waynesboro, Penn., died from a heart attack on January 17. He was 56 years old.

MARTIN F. BENZOW, head of the M. F. Benzow Sand & Gravel Co., Waterloo, Iowa, died recently after a long illness.

JOHN J. WILLIAMS, who was engaged in the crushed stone business in Philadelphia, Penn., for 25 years, died recently in Miami Beach, Fla., where he had been living for several years since his retirement from business.

C. B. CONDON, secretary and general manager of the Hawkeye Portland Cement Co., died suddenly of a heart attack at his home in Des Moines, Ia., on January 26. Mr. Condon was widely known throughout the cement and crushed stone industries, his company producing large quantities of commercial rock as well as cement. Mr. Condon had been a constructive force in the cement industry for many years. He had served as a director of the Portland Cement Association and as member of many important committees and missions.

HERBERT R. BROWNE, technical director of the Michigan Alkali Co., and of the Huron Portland Cement Co., died recently. A native of Manchester, England, Mr. Browne came to America as a young man and was the first chemist employed by the Michigan Alkali Co.

Concrete Products

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Chicago Welcomes Concrete Conventions



Candid photograph showing lighted sign of welcome to the concrete conventions and some of the activity in the lobby of the Sherman hotel during Chicago's big concrete show

MARCH, 1938

Who will they get
to build it of
CONCRETE



...It's UP TO YOU!

Every month in national advertising we are telling the people of your city about the advantages of concrete home construction—and asking them to see *YOU* about it. Here's what we say in every ad:

"Ask a concrete masonry manufacturer or a concrete contractor for the names of architects, builders, realtors experienced in concrete construction."

Do they know how to find you? Are you ready with the answer? That is your half of the job. Go in on concrete demonstration homes; get builders lined up to feature concrete; advertise in news-

(**FREE ADVERTISING PROOFS FOR DISPLAY**)
(Full-page Portland Cement Association advertisement, built around this illustration, appeared in the *Saturday Evening Post*, February 26. Did you see it? Three proofs (packed flat) will be mailed on request. Fine for displaying in demonstration houses, store windows or your place of business.)

papers and phone books and with truck and job signs; put live-wire salesmen out.

Once the concrete idea is sold in your community it will mean a big, steady volume of above-the-foundation business.

PORTLAND CEMENT ASSOCIATION
Dept. A3-45, 33 West Grand Avenue, Chicago, Ill.
A National Organization to Improve and Extend the Uses of Concrete

Producers Going After Housing Market

CONCRETE HOUSES "STEAL the SHOW"

PROMOTION, merchandising and the manufacture of concrete products were discussed thoroughly at the annual convention of the National Concrete Masonry Association held in Chicago, February 8 to 11. Attendance at the conventions of the National Concrete Masonry Association, the National Cinder Concrete Products Association and the American Concrete Contractors Association, held simultaneously, exceeded 2000 and represented an increase of 33 percent.

Manufacturers of concrete products from all parts of the country were present to get new ideas and to inspect new equipment which will help in preparing them for another banner year. The present business recession seemed to have no effect on their enthusiasm in reaching for the "new markets" opening up for products of the industry, particularly in residential construction.

Held simultaneously with the several conventions was the Concrete Industries Exposition in which 50 exhibitors displayed the latest in concrete products equipment, transit mixers and contractors' machinery and accessories. The number of exhibitors increased 50 percent over the number participating in 1937.

Officers

George H. Krier, Nailable Cinder Block Co., Brooklyn, N. Y., was elected president of the National Concrete Masonry Association. Vice-presidents elected were: John S. Chase, Chase Building Products, Inc., Fort Worth, Texas; L. B. Weatherbee, John H. Black Co., Buffalo, N. Y.; and Roy McCandless, Cinder Block, Inc., Detroit, Mich. Walter Sherman, Milwaukee, Wis., of the Milwaukee Concrete Products Association, was elected secretary-treasurer.

Dan F. Servey, Haydite Corp., Kansas City, Mo., the retiring president, was elected chairman of the board of directors. Elected to the board of directors were: Harve Kilmer, Iowa Concrete Crib and Silo Co., Des Moines, Iowa; John Strandberg, Concrete Building Units Co., Kansas City, Mo.; Roy Peck, Western Brick Co., Chicago, Ill.; M. W. Ferguson, Stone-Tile and Supply Co., Inc., Roanoke, Va., and Harry Longenecker, National Building Units Corp., Philadelphia, Penn.

The convention sessions were so arranged that all groups could meet together to hear papers by speakers of na-

tional prominence and individual sessions were arranged for presentation of subjects of particular interest to the individual conventions.

The housing market and its influence upon the demand for concrete products



George H. Krier, Nailable Cinder Block Co., Brooklyn, N. Y., is the new president of N.C.M.A.

dominated the program and considerable discussion was devoted to this subject. One of the outstanding talks on housing was "The Housing Market—Fitting Our Products to That Market," by E. W. Dienhart, assistant manager, Ce-

ment Products Bureau, Portland Cement Association.

Mr. Dienhart reviewed progress already made by manufacturers of concrete products in promoting the sale of concrete masonry for residential construction, and emphasized the extent of the available market. He said that the industry was in a particularly favorable position to obtain its share of the outlay for house construction because the desirable essentials for building materials—firesafeness, permanence, resistance to termites and sagging, low cost—are all inherent properties of pre-cast concrete.

In his opinion, the extent of sales to this market depends mainly on the efforts put forth by individual manufacturers in their promotion of concrete products for residential construction.

Detroit, Mich., was given as an outstanding example of how intelligent, aggressive salesmanship can win for concrete products a good share of the business available in residential construction. He suggested that the ideas that brought results in Detroit would apply in other localities.

The two important issues in selling houses, said Mr. Dienhart, are cost and appearance. He emphasized that the important thing is to sell concrete products for home construction, even if the builder should insist on a frame or brick veneer. He concluded by calling



W. G. Kaiser, P.C.A., Chicago, Ill., and Stanton Walker, Washington, D. C., were all business when snapped in the booth of the National Ready-Mixed Concrete Association



C. Vander Heyden, Milwaukee, Wis., put on his Sunday smile for the camera



W. P. Siegert, Economy Block Co., left, and Tom Noble are in earnest about something



M. W. Bradbyer, The Instone Co., Hammond, Ind., looks over literature in a booth



E. J. Nelson, left, and A. P. Nelson, Spencer, Iowa, on a tour through the exhibit hall



George Brown of East St. Louis, Ill., and Charles Gatzke of Des Plaines, Ill.



Dropping over to see his old associates, "Spec" Collins is here talking to L. B. Weatherbee



White waiting for a session to begin, Ben Wilk, Detroit, Mich., discusses an operating problem



John Strandberg, Kansas City, Mo., as he awaits his turn to speak, is an attentive listener

attention to the fact that wood exteriors are no longer needed as a base for paint.

Views of a Concrete Builder

That builders can make a profitable business in selling concrete masonry houses was proven by Albert E. Bill, Detroit concrete house builder, in a paper, "The Firesafe Concrete Home as a Profitable Enterprise for the Operative Builder." Mr. Bill has specialized in the building of concrete houses exclusively in Detroit for four years and is so thoroughly sold on their merits that he will continue to advocate this type of construction.

In order that the builder be qualified to properly build concrete houses, he must have a knowledge of architecture, the mechanics of building and something of all the trades entering into the construction of a house, said Mr. Bill.

In his opinion concrete makes a sound finished product with which to create appeal and provide an attractive appearance at a competitive price. He said that progress being made by concrete products manufacturers in making special units and varying textures was highly beneficial in house design in the Detroit area.

He described a new model house that he will build of concrete block this year, featuring low upkeep, simple construction and fewer steps, which will be built to yield a fair profit. In 1937, 42 low cost masonry homes were built in Detroit and vicinity by Mr. Bill, a number of which were illustrated by slides.

"The Use of Prefabricated Sections in Wall Construction" was the title of an illustrated paper read by Quentin Twitchman, president, Connecticut Precast Building Corp., Irvington, N. Y.

Concrete Slab Floor and Roof System

A system of precast concrete slab construction, consisting of slabs and light steel webs to be filled with concrete on the job, was described in detail by Eugene B. White, Chicago, Ill., its inventor, in a paper "The 'White-Steel Monolithic Method' of Precast Slab Construction."

This system of construction which consists mainly of reinforced concrete slabs, to have application in the smallest types of buildings as well as in large industrial buildings, was developed mainly to eliminate useless dead loads and expensive form work on the construction site.

In this method of construction form work is eliminated and the dead load in the floor construction is reduced to 33 lb. per sq. ft. for a live load design of 125 lb. with a span of 18 ft., said Mr. White, and there are no departures

from accepted engineering formulae in the design of the system.

Lightweight concrete floor slabs, 5-ft. 9-in. long, 15-in. wide and 2 in. in thickness, are precast in a concrete plant where every facility is available for controlling the uniform quality and strength of the concrete. Welded steel reinforcing mesh runs through each slab and projects from the ends, serving as stirrups when bent down into the hollow steel sections, which make up the webs of the floor system.

Each precast slab is continuous across one steel section and extends to the section on either side, making the reinforcing of slabs and beams continuous. Tension bars are placed in the hollow steel form sections, providing tension reinforcing similar to that in any reinforced concrete beam or joist, and the hollow beam sections are filled with concrete on the job.

A large dowel hole, as shown in the illustration on page 86, is provided at the center of each slab and through this hole a steel dowel-stirrup is placed to project into the beam beneath. Mortising of the side edges of the slabs leaves a V-shaped groove between slabs which partially fills up when the joists are poured and the remainder is filled with cement grout to insure a positive equal transfer of stress from one slab to another. The only structural concrete poured on the job in floor or roof construction is that required to fill the hollow steel joist forms on which the slabs are superimposed.

These hollow steel sections are made of light, cold-formed steel and are placed on 3-ft. centers resting on girders or bearing walls. These forms have sufficient strength to provide an immediate working deck as soon as the slabs are placed, said Mr. White, thus eliminating costly scaffolding as well as forming.

When this system of roof or floor construction is used, Mr. White said that over 72 percent of the concrete consists of precast slabs which are made in a concrete plant under controlled conditions and only a small percentage of the concrete remains to be poured through the openings left between slab ends. Roof decks so made were said to weigh 25 lb. per sq. ft. and to eliminate steel purlins entirely.

Mr. White said that this method of constructing floors as well as roofs was an ideal one for winter construction, since by its use the handling, mixing and placing of large tonnages of aggregates, cement and water are eliminated. It is claimed that work moves ahead with great convenience and speed. The beam sections and the slabs are delivered as the structural frame reaches each floor level.



M. A. Thorpe, left, and C. C. Wetzstein, president, Lake View Concrete Tile Co., Lake View, Iowa



Apparently someone is telling a "good one" to J. E. Kirkham, Topeka, Kans.



Roy McCandless, Cinder Block, Inc., Detroit, Mich., who was re-elected vice-president



F. J. Straub, New Kensington, Penn., is a "regular" who never fails to be present



Secretary-Treasurer Walter Sherman, Milwaukee, Wis., left, and Harry Sorenson, Racine, Wis.



A visitor to ROCK PRODUCTS' booth was Arthur Bryce, Certified Concrete Co., St. Paul, Minn.



The concrete brick he is holding seems to meet the approval of C. Grady Cates, Roanoke, Va.



Otto Ladwig, Jr., Milwaukee, Wis., offers his opinion of machinery on display

The slabs are made by a vibrating process, with automatic control of the water-cement ratio and accurate proportioning of aggregates from automatic measuring bins to insure uniform strength and quality, said Mr. White, and are cured under constant humidity and temperature.

The reinforced concrete design is varied according to span and load requirements by changes in the reinforcing steel and the depth of the T-beam stem. He said that tests conducted by the Robert Hunt Co., Chicago, on a test panel showed that the breaking strength and deflection of the floor system followed definitely the behavior of a true monolithic T-beam section. He concluded with the statement that in addition to time and money saving features resulting from the use of this system, reduced dead loads on structural frames and foundations would reduce construction costs by at least 30 percent.

P. M. Woodworth, engineer and housing consultant, Chicago, Ill., emphasized the importance of having fair rates of insurance in order to compete on an equitable basis with other types of construction, in a paper, "Do We Need More Equitable Fire Insurance Rates on Concrete Masonry Construction?"

Mr. Woodworth said that fire insurance rates on concrete masonry houses establish comparisons with other types of dwellings and that superior types of construction with equitable rates can be made competitive with lower classes of structures on which are assessed higher rates. With construction materials of equal merit, an inequality of rates will of course materially affect sales, said Mr. Woodworth.

Mr. Woodworth said that of 660,000 fires that occurred in 1936, 54 percent or about 360,000 took place in residences, and of the total loss of \$300,000,000, 34 percent or \$103,000,000 was in residences. Sparks on the roofs caused less than 2 percent of the total number of fires, with a loss of \$2,000,000 and 8.8 percent of the losses were due to basement fires.

He told of the efforts that have been expended in attempting to get equitable rates for concrete masonry construction. Fifteen years ago concrete masonry had fire insurance rates that were in no way comparable with those for brick and one state actually assessed a greater rate than for frame construction. In 1925, three states established concrete masonry rates equivalent to those for brick, and today, after an expenditure of about \$100,000, 41 states have established equitable rates.



Laying a fireproof floor, using the White-Steel Monolithic System of precast concrete slabs. Note the dowel holes for tying in the webs with the floor slab

In his paper, "My Experience With the Electrical Curing Process," Benjamin Wilk, Standard Building Products Co., Detroit, Mich., said that the process had indicated interesting possibilities in his short experience with the method at his plant. He described the equipment and said that a variable transformer was developed for the process. About 17/3 amp. of electricity at 20-110 volts was effective in curing each standard concrete unit, or about 160 amperes based on an average of 500 units in a kiln.

Electrical Curing of Concrete Products

He described how an ordinary rack was equipped with galvanized plates and springs to give a correct contact with each unit and how each rack of concrete block was plugged in separately to the electrical connections. At mild temperatures, when cured electrically for six hours, Mr. Wilk said that concrete block could be handled from the pallets with safety in eight hours. The compressive strength at this age would be about 350 p.s.i. Results at Mr. Wilk's plant have shown that pallets can be used more than once daily, materially reducing pallet costs.

In winter operation, seven hours electrical curing give substantially the same results as 18 hours of ordinary kiln curing, and units so cured are very uniform in strength and quality, said Mr. Wilk. Costs of curing by the process have averaged from 1/2¢ per unit to 1¢ dependent on outside temperatures. Initial cost for installation in one 8-x50-ft. kiln in this plant was \$400 plus \$50 in

rack costs. Twenty-seven units are made to a sack of portland cement.

High Pressure Steam Curing

Another development in curing that has aroused much interest was covered thoroughly in a paper "High Pressure Steam Curing in Products Manufacture" by J. Morley Zander, general manager, Saginaw Brick Co., Saginaw, Mich. In addition to his own observations, Mr. Zander quoted the opinions of other operators who are now curing by steam under pressure.

Mr. Zander's investigations show that by high pressure steam curing it is possible to produce a concrete masonry unit completely cured and ready for market the next day after molding; of light color and uniform appearance; strong, dry and hard; and with all shrinkage or future volume change overcome. He said that such a unit is an engineered product that can be produced of the same quality in all seasons of the year and that it has a marked sales appeal to architects and engineers.

Mr. Zander quoted C. H. Carmichael of the Atlantic Brick Co., Watertown, Mass., as saying that architects, engineers and owners who are seeking a block which has been high pressure cured have the assurance that practically all strains to which a block may be subjected have been anticipated by the effect of the high pressure steam curing process. Mr. Carmichael said that distinct differences in the results of air curing or high pressure steam curing methods are identifiable with re-

spect to color, nailability, weight and degrees of difference in "popping" and staining. The high pressure steam cured block or tile is harder than is the vapor cured product, said Mr. Carmichael in his letter to Mr. Zander, and ordinary nails do not pierce the high pressure block with the same ease. This can be overcome by using the proper length of hardened nails appropriate to the job and when once driven the nails are held very firmly.

High pressure steam curing has an effect of color by its bleaching action and the naturally dark color of the cinders is altered to a distinctive blue-gray cast. Temperatures ranging from 340 deg. F to 350 deg. F. evaporate the moisture in the block, making a lighter unit than that made by the open air method of curing.

Mr. Carmichael said that investigations carried out by nationally known organizations indicate that high pressure steam curing practically completes the hydration of the cement and thus eliminates one of the principal causes of volume change. Other data thus secured indicate that there will be no volume change under constant temperature and humidity conditions if high pressure steam units are laid dry in a wall in the same condition as they come from the autoclaves.

It was pointed out that high pressure steam cured units are subjected, in the steaming process itself, to the same treatment which is ordinarily used for testing materials to detect the presence of staining and popping conditions. The high temperature in the presence of moisture is claimed to accelerate the chemical action which leads to staining and popping and to anticipate this action and force its completion within the curing cylinders.

Mr. Zander said that Mr. Kaiser of the Crume Brick Co., Dayton, Ohio, in experimenting with vibrated concrete, had concluded that high pressure steam cured concrete units are more waterproof than concrete units cured by any other method known. Another observation is that a great deal less cement is required to produce units equalling in compressive strength those cured in the conventional manner.

Superior Brick Corp., Minneapolis, Minn., has experimented with different methods of operation in curing under high pressure steam. Cinder concrete blocks are left under 125 p.s.i. pressure for eight hours, with three hours consumed in raising the steam pressure in the cylinder to the boiler pressure. One hour is needed to reduce the pressure following the curing, making a steaming cycle of 12 hours. Freshly made blocks

are placed in a moist room for 12 hours before being placed in the cylinder.

A practice such as this is usual, but newly made blocks placed directly into the cylinder did not reveal any detectable difference when compared to those cured by the 12 hour cycle, said Mr. Reak of the Superior Brick Corp., in his letter to Mr. Zander.

Operating a Steam Curing Plant

Mr. Zander outlined all equipment needed and estimated costs of installing a high pressure steam curing plant to provide for curing 2500 8- x 8- x 16-in. cinder concrete units in 12 hours and



B. F. Affleck, well-known cement manufacturer, left, making a tour of the exhibit under the guidance of F. W. Deinhart of the P.C.A.

gave his recommendations for the installation of such equipment.

The most favored installation, said Mr. Zander, is with double ended quick opening cylinders so placed that the cars of green units go without unnecessary movements into the receiving end and, when cured, are taken from the discharging end into the storage yard. In designing a plant layout, he said that the curing cylinders should be as close as possible to the boiler and should be set with an inclination to drain water to one end.

Single end cylinders are from 50 to 70 ft. in length and double end cylinders range in length from 70 to 120 ft. He recommended, if the water accumulating in the cylinder contains nothing corrosive that will injure the boiler, that it be piped to a booster pump and returned directly to the boiler.

Costs of Steam Curing Under Pressure

In discussing costs of steam curing, it was estimated that from 10 to 16 hours labor is required in the fire room to stoke and attend the boiler each day that steam is required for curing. Manufacturers of sand lime brick generally have found that the fuel cost ap-

proximates 50c per thousand brick, which would indicate a fuel cost of 50c per hundred 8- x 8- x 16-in. blocks. This cost, said Mr. Zander, is offset considerably by the saving in cement.

With high pressure steam curing, if it is not desired or needed to produce concrete products of higher strength, products can be made with less cement. In Mr. Zander's paper, space was given to treatment of the chemical action taking place under the process. It is claimed that when the portland cement hydrates in the mix some calcium hydroxide is released. In ordinary air curing this calcium hydroxide in time likely returns to calcium carbonate. The quantity of calcium carbonate is so small that it is believed to contribute only in a small degree to strength.

In high pressure steam curing this calcium hydroxide is said to combine with the fine silica, if present in the aggregate, to form calcium silicate which is practically insoluble and provides high strength bonding qualities. This calcium silicate supplements the portland cement in the mix and less of the latter is required for a definite strength. Mr. Zander closed with the statement that high pressure steam curing seems to be the best way to produce a non-shrinking, engineered product that merits the confidence of the architect and the building industry.

Covered Storage During Curing

In a third paper on the subject of curing, "The Advantages of Covered Storage in the Curing Process," Floyd Fellebaum, president, National Cement Products Co., Toledo, Ohio, enumerated the benefits of keeping products covered in the storage yard and told how this practice had been instrumental to him in increasing sales. At his plant in Toledo, 13,000 sq. ft. of covered storage is provided for standard units and an additional 5000 sq. ft. for special units. In open storage, he said that units when piled close together freeze to each other and must be re-piled in the Spring, incurring extra cost. In his experience, loading from under cover storage is much easier and quicker, cutting costs to an extent unnoticed unless accurate cost figures are kept.

From the standpoint of the employees, he said that far better working conditions are maintained where employees can work under cover during the cold and wet months. In Toledo, some of the architects specify that units must be cured under cover. Mr. Fellebaum called attention to such a storage system as a valuable selling point, since the average customer today will come to see the products that he is purchasing.

What Constitutes A Good Inventory?

A number of valuable merchandising helps were given by H. E. Kilmer, general manager, Iowa Concrete Crib and Silo Co., Des Moines, Iowa, in a paper, "What Stock Sizes are Necessary to Properly Service a Concrete Masonry Job?"

Mr. Kilmer started up operations 10 years ago in a territory served by seven clay tile plants and has built up a sound and substantial business, showing an increase in volume of 50 to 100 percent annually in spite of the business depression. He reminded those present to go after the house market and above grade construction in order to increase business volume, and placed emphasis on the necessity of manufacturing all types of special units. He said that if the number of units manufactured are limited to the conventional stock sizes, just so long will business be confined to foundations and partitions.

He advised the manufacture of units that cannot be made in clay tile plants and told of his own case where the architects greatly appreciated this service and are constantly asking for more specials. Mr. Kilmer said that business is held by his company on the basis of good will, prompt service and an enthusiastic attitude of helpfulness to the architect.

In his plant, 65 different units are manufactured in 4-, 8- and 12-in. thicknesses, but the special inventory amounts to less than three percent of the total storage. Some of these special units are very seldom specified but are kept available at any time on short notice.

His policy is to see that masonry is used properly at destination, based on the fact that one poor job will go a long way toward offsetting a number of good ones. Some attention is given to the finished job, knowing that a poorly finished structure is as harmful as poor quality units and often the blame is placed on the units.

President-elect George H. Krier, president, Nailable Cinder Block Corp., Brooklyn, N. Y., discussed some of the larger markets for cinder block in his paper, "Getting Business in the Backup Market". A number of large projects using cinder block were illustrated on slides.

At this session a number of Detroit concrete products manufacturers participated in giving the details of the "Co-operative Program of the Detroit Concrete Products Association", which has advanced the industry in Detroit to a stage probably not equalled in any other metropolitan area in the country.

Ray Berger, president, led off the

discussion with a history of the Detroit Concrete Products Association, which has been in operation 18 years, holds meetings at least once a month and now has over 25 members. He told how the members cooperate to put over their products at the Detroit Home Shows held annually.

A Co-operative Program That "Clicks"

He reviewed the activities at the 1937 home show when a house was built to give away, and the individual members took 14 display booths. About 5000 visitors to the show inspected the house on a Sunday alone and from 2000 to 3000 each week day, from which a number of prospects were derived. Partly as a result of this cooperative effort over 40 concrete masonry houses were built in Detroit in 1937 ranging from \$6000 to \$15,000 in price.

He told of the efforts put forth by members of the association in getting their products specified for the entire construction of the "Ideal" concrete masonry house which has just been placed on display at the 1938 show. Construction of this house was begun in September, using sand and gravel concrete block, concrete slabs, joists, concrete floors and areaways. Materials were furnished by the members and labor costs were financed by company membership subscriptions of \$100 and under. A booklet was published for distribution with house plans and the names of subscribers were listed.

The house was built to appeal to contractors and builders and to show them how profits could be made in constructing low cost concrete masonry homes. All structural units used were on display in sections, showing the walls, furring, plastering, roof construction of red cement roof tile and other essential details.

Concessions were obtained and manufacturers of insulation, cement paint and air conditioning equipment cooperated in equipping the home. Even a large fuel oil concern in Detroit participated. R. E. Talcott, chairman of the Detroit Builders Show, elaborated on the details of the exhibits, for which nine booths had already been reserved by member concrete products manufacturers. D. J. Warsaw outlined the successive steps taken in procuring a \$4500 loan insured by FHA, and said that the house was to be sold at the conclusion of the show and that member companies would be reimbursed.

Lansing, Michigan "Goes to Town"

The next speaker was T. H. Merriam, Field Engineer, Portland Cement Association, Lansing, Mich., who had an illustrated paper, "Lansing, Michigan,

Builders Go to Town With Concrete Houses". In Lansing, the concrete house movement has had a remarkable growth in 1937, judging from statistics given by Mr. Merriam, and it is founded on a sound basis.

One out of every six homes built in the Lansing area in 1937 were concrete masonry houses, representing 50, and all were built by private owners and local contractors. The cost of the homes averaged \$3906 in Lansing and \$6637 in East Lansing, with an average of \$5100 for the total. Twenty three of the houses were of modern design, five were colonial and eight were of American design. A number of the houses were illustrated by slides.

Precast Concrete Joist Floors

The last speaker was John Strandberg, Concrete Building Units Co., Kansas City, Mo., whose paper was entitled "Precast Concrete Joist Floors—The Key to Selling Concrete Masonry in Above Grade Construction." Mr. Strandberg emphasized how the desirable properties of concrete masonry—fire-safeness, resistance to termites, low cost, etc.—should be used in promoting concrete masonry houses, and stressed the need for intelligent advertising and service. He said that a manufacturer who believes in construction using his materials should live in such a house himself.

Mr. Strandberg's company has sold four times as many concrete joists in 1937 as in 1936 and he anticipates a similar increase in 1938. In analyzing sales, he said that for every \$1000 sold in precast joists, a sale of \$2000 worth of masonry above grade has been made and that 99 percent of the joist sales have sold other concrete units.

Several of the joint meetings had papers by authoritative speakers which were of great interest to all the concrete producers. Numbered among the subjects of general interest were the addresses, "Today's Building Costs and Building Values" by Bernard Johnson, Editor, *American Builder*; "The U. S. Housing Act of 1937—How it Will Operate" by Ernest Culligan, Chairman, Speakers Bureau, U. S. Housing Authority; "How Recent Amendments Will Help FHA Stimulate House Construction" by A. O. Eberhart, Special Assistant to the Administrator, Federal Housing Administration; and "Progress and Future Prospects for Contractors" by W. D. M. Allan, Director of Promotion, Portland Cement Association.

The convention concluded with round table discussions by producers on sales promotion, manufacturing problems, new methods of construction, specifications and business prospects.

Discuss Problems Involved In Pipe Manufacture at CONCRETE PIPE CONVENTION

WITH MUCH OF THE DISCUSSION devoted to irrigation projects, a topic of much interest to pipe manufacturers in the West and Southwest at the present time, the 31st annual convention of the American Concrete Pipe Association, held in San Antonio, Texas, February 15-16, proved a most constructive and educational meeting for those in attendance.

H. W. Chutter, Jourdan Concrete Pipe Co., Fresno, Calif., was elected president, succeeding F. W. Paulin, Great Lakes Concrete Pipe Co., Hamilton, Ontario, Canada. W. F. Paddock, Concrete Pipe Co., Ampere, N. J.; H. Eschenbrenner, Universal Concrete Pipe Co., Columbus, Ohio, and Wm. B. Freeman, Lock Joint Pipe Co., Denver, Colo., were elected vice-presidents and M. W. Loving, Chicago, Ill., was reelected secretary-treasurer.

New directors included J. A. Dunn, Hume Pipe Co., Swampscott, Mass., R. S. Lander, Shearman Concrete Pipe Co., Little Rock, Ark., and G. B. Denham, Faulkner Concrete Pipe Co., Hattiesburg, Miss. Also added to the Board of Directors was retiring President F. W. Paulin, who fills the place vacated by the election of H. W. Chutter to the presidency. San Francisco was heartily endorsed for the 1939 convention city, although definite selection will be made later by the Board of Directors.

Following reports of the various committees and that of Secretary-Treasurer M. W. Loving, President Paulin, in his address, called attention to the steady increase in taxes, and the fact that the majority of the tax burden had been placed upon real estate, urging members to use their efforts in controlling this trend. He predicted a business

improvement, but advised the necessity of close attention to individual business operations.

This session concluded with a general discussion of the use of concrete pipe in the oil fields where the salt water drained from the wells is more highly concentrated than sea water, and is of a different chemical composition. The discussion brought out that the various oil fields offered complex problems; that the chemical contents of this salt water varied according to the locality; and that the problem was, in most instances, a local one. Reports indicated that concrete pipe was proving very satisfactory in East Texas oil fields, according to tests conducted by a major oil company.

The Drainage Problem in Texas

M. R. Mitchell, Texas State Highway Department, read a paper on the "Design and Construction of Highway Drainage Structures in Texas," pointing out that approximately 21,000 miles of highways served more than 262,000 square miles, and presented a serious drainage problem since "our highways cross nearly every drainage slope and encounter nearly every type of soil and surface conditions that are known to exist," while "the native vegetation varies from the heavy swamp growth to the sparse grass and cactus growth."

In the selection of the type and size of small drainage structures, he said that Texas has developed a plan of making accurate surveys of each area to be drained. By these surveys, the actual number of acres involved is ascertained and the nature of the land

surface, use and vegetation are determined for application in run-off formulas. In addition, the character of the soil, on which the structure is to be placed, is examined by test holes and borings.

"The choice of the type of drainage structure to be used is dependent upon the character of the soil, the amount of fill, the availability of materials, and the ultimate cost and maintenance of the structure. We have locations where a rigid type is preferred. You will be interested to know we have found that concrete pipes are very desirable for performing the proper functions in an economical manner in many locations.

"One of our problems in the selection of types of drainage systems is the development of a small drainage structure of permanent materials with sufficient flexibility to follow the changes in earth pressure due to swelling, shrinkage and settlement. You would, perhaps, suggest that concrete pipes with asphalt joints be used. The State Highway Department, however, must specify and use products that can be procured in a competitive market and, in the flexible joint field, many of the most desirable products are limited in manufacture and use because of patent restrictions."

During the past ten years, he said that the Texas State Highway Department has designed and constructed more than 125 miles of major bridge structures, and in an average year will build about 120 major structures, and at least 2000 small drainage structures. In the volume of small drainage structures built, pipes of all types are used on about 46 percent of the length, and concrete pipe culverts, not including underdrains, will represent 23 percent. In an average year, about 13.3 miles of concrete box culverts, 5.6 miles of concrete pipe structures, 4.5 miles of underdrains of all types, and 1.9 miles of other types of drainage structures are built in Texas.

About \$7,000,000, or 30 percent, of the annual expenditure for highway work in Texas is spent on bridges and small drainage structures. In addition approximately \$3,800,000 is spent through maintenance other than regular work. Mr. Mitchell predicted that the use of drainage structures of all types would be increased in the future development of erosion control and



Officers and directors of the American Concrete Pipe Association. Bottom row, left to right: Wm. B. Freeman, vice-president; H. W. Chutter, president; F. W. Paulin, director; R. S. Lander, director; J. A. Dunn, director. Top row, left to right: G. B. Denham, director; M. W. Loving, secretary-treasurer; F. B. Gray, director; L. D. Bailey, director; W. F. Paddock, vice-president

traffic safety on highways and concluded his address with a motion picture depicting various conditions, scenes and interesting achievements in the Texas Highway System.

Federal Legislation

Wilbur Keith of the Social Security Board discussed at some length phases of this legislation of interest to employers, emphasizing that, in all cases where there is a conflict of opinions, the decision is with the Department of Internal Revenue. Keith stressed the fact that the Federal Old Age Insurance is administered by the U. S. Government alone, and that it has no connection with any other form of social welfare, either state or federal; that casual labor, even for a few hours, if it is essential to the promotion of the business, should be reported; that a person may work in three, four or any number of places, drawing a salary in each, and that that person and each employer is liable for a report in each instance, up to \$3000.

Concrete Irrigation Pipe Lines

A movie of Mexico was shown in one of the meetings, following which H. B. Ogle, Valley Concrete Pipe and Products Co., Chico, Calif., gave an address on "Design and Construction of Concrete Irrigation Pipe Lines in the Sacramento Valley of California." The project represented the first unit of pipe, consisting of 30 miles, which was to serve four subdivisions on the Rancho San Vicente. Each of these subdivisions consisted of approximately 330 acres, each having its own water supply, buildings, pumps and irrigation pipe system. Because of water conditions, it was necessary to drill wells, and the pipe system consisted of a main force line from which lateral pipe lines were run at intervals of 600 ft.

These force lines consisted of reinforced concrete pipe 16-in. in diameter, excepting near the end of the lines, where some 14-in. pipe was used. About nine miles of the 38.5 miles of pipe consisted of such force lines.

To build these lines it was decided to use machine-made pipe, using spiral steel cages for reinforcement. After interviewing some of the concrete pipe men of the valley, however, it was found that the majority of them thought it was not feasible to use steel spirals in cage form in their pipe machines, and there was a difference of opinion among them as to whether they could build this type of pipe by machine.

This difficulty was eliminated, however, and the wall thickness decided



Three nations represented at the convention. Left to right: Carlos Alonso, Mexico City, Mexico; R. S. Lander, Little Rock, Ark., U. S. A.; and F. W. Paulin, Hamilton, Ont., Canada

upon as follows: For 16-in. pipe, pressure 15 to 30 ft., 1 $\frac{1}{8}$ -in. shell; for pressures of 30 to 70 ft., 2 $\frac{1}{4}$ -in. shell; and 70 to 170 ft., 2 $\frac{1}{2}$ -in. shell. Other shell thicknesses were not available in the valley.

The cage used consisted of four vertical back and tie rods onto which was wound round steel spirals, the cages being made collapsible for shipping. The ends of the vertical backrods were turned over about $\frac{1}{2}$ in. on each end, to act as spacers when placed in the pipe jackets, and the steel spirals were wound to a diameter to provide for one-half inch concrete cover over the outside of the steel reinforcing cages. These cages were built so that they provided a snug fit into the pipe jackets, and the end spirals embedded one inch from the end of the finished pipe sections, which were three feet long. Steel consisted of rods having a tensile strength of 60,000 to 70,000 p.s.i.

In the design of steel reinforcing spiral cages for working pressures of between 20 and 50 ft., unit stresses on steel were set at 16,000 p.s.i.; for pressures between 50 and 110 ft., 14,000 p.s.i.; and for pressures between 110 and 170 ft., 12,000 p.s.i.

The standard concrete mix used on the lines was one sack of cement to 3 $\frac{1}{2}$ parts of aggregate, consisting of equal parts of sand and crushed rock, in which the sand was 50 percent No. 1 and 50 percent No. 2, and the crushed rock 50 percent crushed granite to pass through a $\frac{1}{4}$ -in. ring, and 50 percent through a $\frac{1}{2}$ -in. ring. The aggregates were mixed dry and then about three gallons of water were added for each sack of cement.

A heavy reinforced concrete block was poured at the connection with the underground discharge from the pump to the force line to withstand water hammer and surge shocks. Water hammer and surge has been found to be greater on the section of the force line

from the check valve over the first 50 to 100 ft. beyond, and for this reason three additional spirals are used in the reinforcing cages at this point.

Some Recommendations

Alfred Tamm, consulting engineer, gave one of the surprise talks of the meeting when he sharply criticized the delegates for numerous weak points in their methods of operation. He recommended that pipe be made as the engineer specified, and if the manufacturer wanted to guarantee his pipe for three years, he should so inform the engineer, so that the specifications could be made accordingly. He also recommended that a "stamp of quality" be adopted by the association which, when placed on pipe made by an association member, would guarantee the quality of the pipe. He also recommended that the internal smoothness of pipe should be clearly defined, and so followed. Other recommendations made were:

That five specimens be included with each lot instead of the customary two.

That in testing of pipe, the pressure should be brought up to the pre-determined point and held for one minute.

That all pipe should be properly cured before being shipped.

That the maximum absorption limit of 8 percent, established by the sewer manufacturers in 1917, be reduced to 6 percent. W. O. Liston recommended that the thickness of pipe for use in the Valley should be increased.

Among the changes recommended were the elimination of the paragraphs on fine and coarse aggregate, which are to follow the same specifications as C-14 in the sewer specifications. The variation in shell thickness at any point shall not be less than the minimum specified by more than 10 percent, according to the suggested changes. It was further recommended that a load bearing and a seepage test be added and that definite limits be added for finish requirements.

Developing New Markets for READY-MIXED CONCRETE

By W. D. M. ALLAN*

Director of Promotion, Portland Cement Association

WHILE THERE IS A TENDENCY for every sales organization to strike hardest for the business that is immediately available, creative selling, the development of new uses and users, will build up a growing and stable market. Two or three large jobs in a community may cause a ready-mixed concrete plant to work at capacity, but when they are completed there may not be any more large jobs of the same kind available and the plant is without orders. Therefore, the more outlets developed for concrete, the more stable the business and the less suffering when slumps may come.

Experience in the concrete products field may be cited to show the need for a market with a broader base. As a result of the 1936 PCA national housing advertising, 60,000 inquiries were received and turned over to concrete products men as leads for prospects. Fieldmen in checking up the various communities found that products men in some cities were not following up housing leads because they may have had a 50,000 block order on a school, armory or other large building. While a 4000 block order for a residence may not be very large when compared with a 50,000 block order for a public building, the housing field is a new and continuing market in which hundreds of 4000 block orders are potential. On the other hand, as soon as PWA resources are withdrawn, the number of jobs is greatly reduced and the market becomes unimportant.

A word of caution should be mentioned in connection with the use of data on trends in building construction. Predictions of from 500,000 to 1,000,000 housing units a year have been made, but they may be classed as the product of wishful thinking. F. W. Dodge Corporation estimates have been the most reliable. Too much emphasis should not be placed on national trends, because while a particular territory may parallel the general trend the type of business may or may not be such that a large volume of ready-mixed concrete is available. The local territory may run counter or far ahead of average trends, and local conditions must al-

ways be balanced against general trends.

Construction business for the first half of 1938 will probably be below the corresponding period for 1937, but general agreement holds to the belief that there is likely to be a resumption in the latter half of 1938 which will bring up the total for the year above 90 percent of the 1937 figure. It is estimated that one and two-family house construction will show an increase of about 10 percent above 1937, but local conditions may result in an increase or decrease of this percentage in a particular locality. Everyone is agreed, however, that the backlog of unfilled small house business is the largest in the building field and eventually will result in a very large volume of business.

Remodeling and repair business should not be overlooked in the endeavor to increase the new construction market. While it is not spectacular, a sufficient volume make it worth while.

Methods of Obtaining Business

Methods of obtaining business in the large unit market differ considerably from those which may be successfully used in contacting the small unit market. A large unit sales organization cannot be shifted bodily to a small unit market with the expectation of having the salesmen turn in volume comparable to previous records.

If it is assumed that the biggest opportunities for developing new business are in the small unit field, such as, housing, remodeling, repairs, foundations, driveways, etc., the orders will range from 2 to 50 cu. yd. To obtain volume, a great many sales will have to be made. Another problem is that the prospects are scattered over a large territory, and the use of salesmen to search out prospects for ready-mixed concrete is impractical. Only mass selling methods are effective. Some of the better known mass selling methods include: personal letters; printed matter; advertising in news and local builder papers; newspaper and other forms of publicity; exhibits; classified phone directory advertising; brilliantly painted trucks; and billboards.

All these forms of advertising should take into consideration the following

ideas: the improvement promoted should be extensively needed in the market; advantages of concrete and the convenience and extra advantages of ready-mixed; definite suggestions for prompt action; a clear statement as to where the ready-mixed concrete can be obtained, including name, address, and telephone number prominently displayed.

The Portland Cement Association will cooperate with the National Ready-Mixed Concrete Association in the preparation of a series of eight or ten letters which may be used as the basis for local selling and also booklets or circulars that may be used locally.

It also may be desirable for several ready-mixed men to get together in the preparation of a series of circulars or booklets, leaving a space for the imprinting of the name and address of the individual producer. This would save printing costs. Suggested advertising copy for local newspapers has been prepared by the PCA for ready-mix producers. In the larger markets where several large ready-mix plants may be operating, it may be profitable to consider a cooperative educational advertising campaign which would be signed with the names of all the producers in the metropolitan area. This may be followed up by advertising by the individual companies in a direct selling drive. Advertising to be most effective, however, must be continuous in order to obtain the best results.

Suggestions for Increasing Business

An increased outlet for ready-mixed concrete is very often created by having the building code changed to permit an 8-in. concrete wall instead of a 12 to 16-in. stone wall or a 12-in. brick wall.

Sidewalks in many of the older cities are badly out of grade and in need of repair. Ordinances have been passed in these cities requiring all sidewalks which are away from grade to be replaced. A newspaper campaign or action by service clubs may sponsor the passage of an ordinance requiring property owners to repair sidewalks within a certain length of time. Another idea is to require that driveways crossing sidewalks should be

*Abstract of an address before the National Ready Mixed Concrete Association meeting at Cincinnati, Ohio.

6 or 7-in. thick to prevent trucks breaking the walks.

If fire zones are extended, ready-mix producers will find that fire-proof construction must be used, offering new market possibilities. As the question of public parking areas is becoming acute in many cities, the idea of public parking areas in vacant lots to get the cars off the streets may be promoted with profit to the ready-mix producer. Inside curb parking is another idea worth developing.

Reinforced concrete houses also offer a very large market for ready-mix concrete. The PCA development department is now working on plans to improve a method of construction whereby residence walls are cast in a horizontal position and lifted into place. This plan eliminates form work and permits the use of large production tools in placing, finishing and erecting, and it can be applied to residences, small commercial and farm buildings.

Concrete first floors in residences are becoming popular, more than 20,000 such floors having been built in 1937. This plan offers a potential market of 3,000,000 cu. yd. of concrete annually. This development was started only three or four years ago and has grown very rapidly. Many frame houses have been built with concrete first floors.

Concrete Block and Brick

DEVILLE AND NICHOLSON, Opelousas, La., has purchased equipment including a concrete brick machine having a daily capacity of 8000 brick and a block machine to produce 500 concrete block per day. Clayton D'Avy will manage the plant.

Ready-Mixed Concrete

ALBERT VON UNWRETH, Muskogee, Okla., is reported to be considering the establishment of a ready-mixed concrete plant at Vinita, Okla.

Elects Officers

CUNARD-LANG CONCRETE CO., Columbus, Ohio, at a recent annual meeting reelected Dr. C. L. Spohr, president. Other officers reelected were Joseph H. Bott, vice-president, and George Lang, secretary-treasurer. According to the annual report, business doubled in 1937 over 1936 and was one of the best in the company's history.

Increases Facilities

CONCRETE SUPPLY CO., Evansville, Ind., has recently increased its capacity by addition of a new 300 ton sand and gravel hopper, and has added two more mixer trucks, making a fleet of 11

trucks. Business has been very good during the year, and a number of large structures have been built with ready-mixed concrete. The firm has also introduced "Sakrete," a mixture of sand, gravel and cement used for making minor repairs around the home.

Building Block Plant

RUSSELL TRAVIS, Glasgow, Ky., is building a new concrete block plant adjacent to the Rhea Price quarry property in Bowling Green, Ky. The new plant, 36x40 ft. in plan, will have a normal daily production of 6000 block, using limestone aggregate.

To Rebuild Plant

ATLAS BUILDING MATERIAL CORP., E. St. Louis, Ill., is planning to rebuild its concrete products plant, recently destroyed by fire. In the meantime shipments are being made from stock.

To Double Capacity

ONTARIO CONCRETE PIPE CO., Boise, Idaho, is constructing a plant to double its present capacity. Claude Bingham, of Caldwell, is president of the company, Mrs. Bingham is vice-president and Earl Bull, secretary-treasurer, is also manager.

Cash in on this Market. A Sweeping Demand for CONCRETE JOISTS!



No Experience Necessary

This 10-gang Concrete Joist Mold will enable you to dominate the building market in your city with pre-cast concrete joists. Every labor-saving improvement has been built into this machine and the operators are assured of perfect products at every filling.

Amazing profits with only limited investment.

Write for complete details today.

R & L CONCRETE MACHINERY CO. KENDALLVILLE INDIANA

The demand for concrete floor joists has opened up a new and profitable line for concrete products producers. The huge low-cost housing programs of the Federal government and large insurance companies will triple this demand all over the country.

Be first in your locality to capitalize on this opportunity.

Illustration shows Vibrating Table, or Stand, with 10-gang Joist Mold clamped into place, ready for filling with concrete. Overall Dimensions of unit shown above are: length 22' 2", width 3' 8", and height 3' 4". Complete equipment as shown weighs 5,500 pounds, shipping weight approximately 6,000 pounds.

New Ideas in Manufacturing and Selling

CAST STONE CONVENTION

MUCH PROGRESS has taken place in recent years toward the development of better quality cast stone and in promoting its use, according to reports and papers presented at the annual convention of the Cast Stone Institute.

The convention, held in Chicago, February 7 and 8, was one of the participating groups in Chicago's second consecutive annual concrete week. Many of the members availed themselves of the opportunity to attend meetings of the National Concrete Masonry Association which followed for the remainder of the week.

Officers

Herman Frauenfelder, Rock Hill Precast Concrete Corp., St. Louis, Mo., was again chosen president of the Institute. Other officers are M. A. Arnold, Greensboro, N. C., vice-president and O. L. Formigli, Berlin, N. J., secretary-treasurer. L. A. Falco, New Haven, Conn., and George Saffert, New Ulm, Minn., with the officers, were chosen members of the board of directors.

Following President Frauenfelder's opening address, in which he stressed the need for unity in solving industry problems, C. G. Walker, Chicago, assistant secretary, presented the annual report of the secretary. Mr. Walker reviewed progress made by the Institute since its beginning ten years ago. According to his report, in which he brought out that membership had been practically doubled in 1937 as compared to 1936, he felt that the cast stone industry in the past few years has shown a definite desire to work together for the common good of all.

Work has been done by the Institute during the year 1937 along three major lines, said Mr. Walker. These are in the preparation of basic specifications for cast stone, visits to regional members and field work among architects supplemented by direct mail. He discussed tests made on the application of the vacuum process to the manufacture of cast stone and other methods designed to remove excess water. Other research work has been done on the application of the electric hammer to molding and on molding dressing.

In the discussion that followed Mr. Walker's report, questions were brought up as to the qualities of cast stone manufactured by various methods. He said that tests had revealed poorest re-

sults where tamping was used, but pointed out that the reason for these observations was in faulty application of the tamping process and not to the



Herman Frauenfelder

method. Experiments have been conducted in the laboratory on the application of the vacuum process of extracting excess water, to determine its value in the elimination of voids. Preliminary testing of the process has revealed that the strength of cast stone so made is increased materially and that there is a marked reduction in absorption.

Manufacture of Cast Stone by Electric Hammer

One of the most instructive papers on manufacturing processes was that of Herman Frauenfelder on the "Application of the Electric Hammer to the Manufacture of Cast Stone," in which he discussed and illustrated how a Syntron electric hammer is used to advantage in placing concrete in the molds at the plant of the Rock Hill Precast Concrete Corp., St. Louis, Mo.

This device had been tried experimentally in the Portland Cement Association laboratory and has worked out so satisfactorily that its use has definitely been adopted at Mr. Frauenfelder's plant. It is powered by 60-cycle alternating electrical current and strikes 3600 blows per minute over a 2-in. bed of material in the mold box.

According to Mr. Frauenfelder, "vibration under pressure" applied by the electric hammer produces a very dense

stone which is easy to handle. Motion pictures illustrated how effectively a workman with experience could slide the hammer over the surface of the material in a manner very similar to troweling. Less water is used in the manufacture of cast stone by the electric hammer method. According to Mr. Frauenfelder, there is no saving in time with this equipment as compared to the air or hand tamping methods, but its use has made an excellent product and the workmen favor the use of the electric hammer when once accustomed to it. Considerable discussion followed the presentation of his paper.

Coloring in Cast Stone

Hugo K. Graf, architect, St. Louis, Mo., discussed "The Practical Application of Color to Architecture Through the Medium of Cast Stone", and emphasized the importance which will be placed on the use of colors in the architecture of the future. Mr. Graf said that the cast stone industry is in a particularly favorable position to take advantage of the opportunities to be afforded in color. His talk was illustrated with slides.

Laboratory Experimentation

C. G. Walker reported on laboratory tests on pointing compounds which were started in 1936, tests which were undertaken because of objections raised by architects to poor joints. A survey has been made, revealing that properly made quality stone will not show opened joints. The two solutions suggested were the removal of excess moisture and the practice of pointing with adhering compounds. Tests made during the year on the use of elastic pointing compounds were described. In tests for the removal of moisture, a cast stone specimen was made, using 5.07 gal. of water to the sack of cement and then vibrating the unit. The vacuum process was then applied, removing one gallon of water, and the specimen tested 8630 p.s.i. at 28 days.

During an evening meeting, a practical demonstration of the manufacture of cast stone was conducted in the laboratory of the Portland Cement Association to illustrate the use of the electric hammer and other processes.

(Continued on page 95)



Make
CONCRETE PIPE
for
BIG PROFITS

Low in first cost and practically no maintenance costs. It will pay you to investigate. Write for complete details at once.

No experience necessary to make the highest grade pipe with "Crescent" equipment. Every part is precision-made and the entire unit is so easily operated that any common laborer can run it with a few simple instructions.

This all-steel bell-end form is constructed of prime blue-annealed steel, substantially reinforced with angle and bar steel, electric welded and riveted to assure long life and uniform pipe.

The R & L line includes forms for making all sizes of Bell-end and Reinforced Tongue-and-Groove Concrete Pipe.

• R & L •
CONCRETE MACHINERY CO.
KENDALLVILLE, INDIANA

CORED STEEL PALLET

Better Blocks are made on Cored Pallets
and

The best Cored Pallets are made of steel by

"COMMERCIAL"

they will not crack, break or bend—are easily handled and can be stacked near block machinery in small space for use.

Even easier to handle than plain pallets, they cost less, and you do not need to pay excessive freight bills on Commercial Cored Pallets. In fact, the freight paid on plain pallets will buy a lot more "Commercials" and you know the machines cored pallets are used in, are not excessively priced.

So tell your equipment dealer you want "Commercial Cored Pallets."

The **COMMERCIAL SHEARING &
STAMPING COMPANY**
YOUNGSTOWN, OHIO.

QUINN PIPE FORMS

HAND or WET PROCESS

Make concrete pipe on the job with QUINN PIPE FORMS. Quinn Pipe Forms can be handled by less experienced labor and produce uniform concrete pipe of highest quality. The recognized standard of all concrete pipe.

HEAVY DUTY CONCRETE PIPE FORMS

Built to give more years of service—sizes for any diameter pipe from 12 to 84 inches—tongue and groove or bell end pipe—any length. Backed by years of service in the hands of contractors, municipal departments and pipe manufacturers.



NEW MEDIUM DUTY CONCRETE PIPE FORMS

Meet the demand for low cost equipment that produces a uniform quality of pipe in smaller amounts. Complete in every way. Stands up on any job. Same sizes as "Heavy Duty," from 12 to 84 inches—any length.

WRITE TODAY

Get complete information on prices and Special Construction features of Quinn Pipe Forms. Give us size of job for estimate on your pipe form needs.

Also manufacturers of concrete pipe machines for making pipe by machine process.

QUINN WIRE & IRON WORKS

1603 TWELFTH ST.

BOONE, IOWA

Cast Stone Convention

(Continued from page 93)

A. J. Boase, manager, Structural Bureau, Portland Cement Association, spoke on "The Future of Cast Stone as Affected by the Increasing Use of Concrete Architecturally". He reviewed progress made in the applications of cast stone in recent years and showed slides to illustrate outstanding creations in cast stone in use architecturally in foreign countries.

The business sessions concluded with suggestions by Mr. Walker on how to improve the promotion and selling of cast stone and with an informal open discussion of common problems of plant operation. The convention was adjourned after a group dinner followed by a business session at which the various committee reports were heard and the Institute program for 1938 was discussed.

Enjoys Rapid Growth

TRANSIT MIXED CONCRETE Co., Pasadena, Calif., according to a recent newspaper report, has within seven years grown from a small one-man business to an organization of over 50 employees, doing an annual volume of business exceeding a half million dollars. A fleet of 15 trucks distributes concrete all over Los Angeles county.

Heads Association

FRANK E. GLASA, Berthelet Fuel and Supply Co., Milwaukee, Wis., was re-elected president of the Milwaukee Concrete Products Association at its annual meeting. Other officers elected were Walter J. Manhardt, vice-president; Otto Ladwig, Jr., treasurer; and Walter A. Sherman, secretary, consulting engineer and marketing counselor.

New Plant

VIRGINIA CINDER BLOCK plant, owned and operated by W. S. Hodges, recently went into production in Narrows, Va., near Roanoke. The plant has a daily capacity of 1000 cinder block.

Blast Plant

MODERN CEMENT Co., Valley Stream, L. I., had its plant destroyed recently by two explosions of unknown origin, followed by fire.

Concrete Products

ATLAS CONCRETE BLOCK CORP., Columbus, Ohio, has filed incorporation papers for construction of a plant to manufacture concrete block and slabs. Jack Kooperstein is president of the corporation, I. M. Harris is secretary-treasurer and general manager and

James Whitesell is superintendent. All officers reside in Columbus. Papers called for the issuance of 250 shares of no-par-value stock.

New Products Plant

MORTARLESS CONCRETE BLOCK Co., Palm Springs, Calif., is reported to be considering a location for a new plant in Twenty-Nine Palms, Calif.

Competition

DES MOINES, IOWA, is building a sewage disposal plant which will utilize 500,000 concrete brick, but local concrete products plants didn't get the business. Boys from the National Youth Administration are making 1000 units per day.

Resume Operations

UNITED STATES GYPSUM Co., Chicago, Ill., has resumed operations in its asbestos shingle department at the East Chicago, Ind., plant. The plant was built a year ago.

Cinder Concrete Brick

PYRAMID GYPSUM Co., Salt Lake City, Utah, is considering another cinder brick plant for establishment at Pocatello, Idaho, having completed one recently at Jerome, Idaho.

Patented Construction

EMIL SCHMELLER and TED SCHOENBERG, Chewelah, Wash., recently demonstrated a model house in Spokane, Wash., featuring a double wall of reinforced precast concrete units. Mr. Schmeller has applied for a patent on this type of construction.

Heat Ready-Mixed

MIDDLETOWN SAND AND GRAVEL Co., Middletown, Ohio, has installed equipment to heat ready-mixed concrete for cold weather construction. The company has grown rapidly and supplies much of the builders' supplies in its area.

Ready-Mixed

JOHN T. DYER QUARRY Co., Birdsboro, Penn., is planning the immediate construction of a ready-mixed concrete plant in Pottstown, Penn. Deliveries will be made in truck mixers of 2½-cu. yd. capacity.

Purchases Plant

ST. CHARLES CONCRETE BLOCK plant, St. Charles, Minn., was recently purchased by Walter Kroning. The equipment is to be moved to a new location.

Concrete Pipe

JACKSON CONCRETE PIPE Co., Jackson, Miss., formerly the Jackson Concrete Construction Co., has a new plant under construction for the manufacture of 8- to 24-in. concrete sewer pipe.

Ready-Mixed Concrete

ROLING CONCRETE Co., Ada, Okla., has started the production of ready-mixed concrete on a small scale. Eugene Roling is manager of the company.

New Plant

HAWAIIAN TRANSPORTATION AND ROCK PRODUCTS, LTD., Honolulu, Hawaii, a new firm, is planning construction of a concrete tile plant. Francis J. Cooper is president and manager of the company.

Paving Highway With Gold

GOLD-BEARING GRAVEL will be used in paving a seven-mile section of highway under construction near Helena, Mont. Henry M. Lancaster, mining engineer, said tests in the pit which is to supply the gravel showed about 60c worth of gold per cubic yard. There is not sufficient water in the locality to permit placer mining or dredging.

Stone Company Buys Town

THE INLAND LIME AND STONE Co., Manistique, Mich., has purchased the townsite and all the buildings of Hunt Spur, in the northern peninsula of Michigan on the Soo Line railroad, and is preparing to clear the site for an extension of its present quarry. The company now operates a limestone quarry directly north of the former town, with a plant six miles to the south at Port Inland on the shore of Lake Michigan. The purchase will greatly enlarge the company's property at this point and will permit the development of a larger quarry.

Laboratory Equipment

SOUTH DAKOTA STATE CEMENT MILL, Rapid City, S. D., was host to the South Dakota Society of Engineers and Architects when the Society held its annual meeting in Rapid City on November 4. The entire plant was inspected by members of the group. The state has recently purchased several thousand dollars worth of new laboratory equipment for the mill.

Dissolution

STAR SAND & GRAVEL Co., Tacoma, Wash., has filed notice of voluntary dissolution, the company having been capitalized at \$50,000. The notice was filed by Weter, Robert & Shefelman, Northern Life Tower, Seattle, Wash.

FLAM scores a smash hit with CONCRETE TILE MACHINE



Featured by lowest possible cost, both as to initial investment and operation, this new FLAM CONCRETE TILE MACHINE offers every concrete products producer an opportunity to build a highly profitable business.

Makes all sizes from 2" to 8" high. 8-hour capacity: 2500 Standard 8" Tile; 3200 Standard 6" Tile; 4500 Standard 4" Tile; or 8000 Standard Brick.

Contains no gears, clutches or other troublesome parts. Total weight less than 500 lb. Can be used for permanent or portable plant.

It will pay you to investigate. Write for complete details.

STEPHEN FLAM
Concrete Tile Equipment
SHERMAN OAKS, CALIF.



● Typical units made on FLAM machine

New Concrete Building Unit

BUILDING UNITS CORP., Milwaukee, Wis., has published a 4-page illustrated pamphlet describing the manufacture and pointing out the advantages of "Blox", a channel shaped concrete unit designed especially for the construction of residences. The units are designed to accurately fit together, and it is claimed that construction costs are reduced materially by their use. They can be made of any approved lightweight concrete aggregate which is low in absorption and high in insulation value and compressive strength. The method of manufacture briefly consists of vibration in cast iron machined molds in which the units remain while being cured in high pressure cylinders.

Concrete Housing in Foreign Countries

CONCRETE MASONRY CONSTRUCTION is going over big in foreign countries, according to reports on equipment shipments. A large part of the output of concrete units is being used in the construction of low cost, firesafe residential construction. The Besser Manufacturing Co., Alpena, Mich., in 1937 shipped two large machines to Honolulu for the manufacture of units for construction work sponsored by the government.

A large, completely unitized plant was shipped to Venezuela last August to produce units for the construction of 800 low-cost homes being built under government sponsorship. During the year, small block machines have been shipped to the British West Indies, Liberia in West Africa and France.

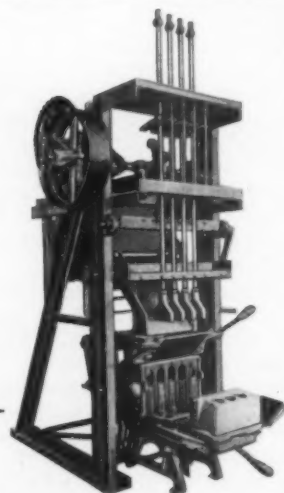
Distributor

UVALDE ROCK ASPHALT CO., San Antonio, Tex., has appointed the West Virginia Terminix Co., Charleston, W. Va., distributor for its Azrock asphalt tile products. Azrock tile is a new floor covering, being used in homes and buildings of all types.

Looking for New Industry

RICHARD W. SMITH, Director of the Division of Mines, Mining and Geology of the Department of Natural Resources, State of Georgia, has two assistant geologists searching northwest Georgia for raw materials to make rock wool.

REARDON CEMENT CO. and REARDON COLOR AND CHEMICAL CO., Cincinnati, Ohio, manufacturers of masonry cements, rock wool, mortar colors, waterproofing, etc., announces the opening of a sales office in New Orleans, La.



"ANCHOR"

Complete equipment for making concrete, clinder and other light weight aggregate units, including engineering service for plants and revamping of old ones for more economical service.

Hobbs block machines, Anchor tampers, Anchor Jr. strippers, Stearns power strippers, Stearns mixers, pallets, Straublox Oscillating attachments, etc.

Repair parts for Anchor, Ideal, Universal, Stearns, Blystone mixers and others.

Anchor Concrete Mch. Co.

G. M. Friel, Mgr.

Columbus, O.

SPECIAL AGGREGATE

SPARKLING MARBLE SPARKLING GRANITE

All colors—all sizes

TAMMS SILICA COMPANY

228 North La Salle Street Chicago, Illinois

DOLOMITE MARBLE

CaCO₃ MgCO₃

Ground or Pulverized

Universal Marble Products Corp.
THORNWOOD, N. Y.

MOLDS AND FORMS

MOLDS

For all kinds of garden furniture, porch and cemetery.

Send for Catalog

Artisan Mold Works

531 James St.
Elkhart, Ind.



CEMENT COLOR

STAR and ANCHOR COLORS

Geo. S. Mephram Corp., East St. Louis, Ill.
C. K. Williams and Co., Easton, Penn.

CEMENT COLORS

Will not fade—extra fine and strong

TAMMS SILICA COMPANY

228 North La Salle St. Chicago, Illinois



Massachusetts Cement Block Company of Medford, Mass., make this large number of units on one set of plain pallets.

**CASHING IN ON QUALITY
WITH LESS INVESTMENT**

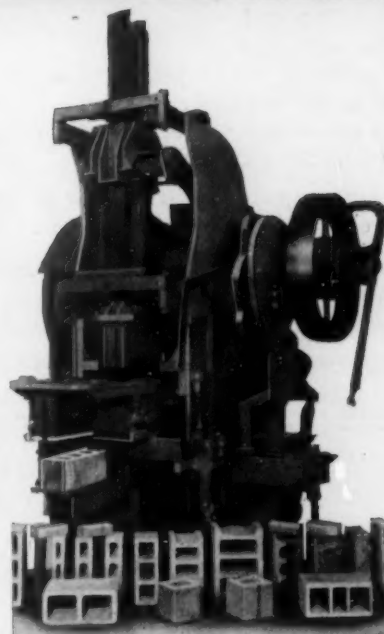


**FULLY PRESSED TOP BRICKS ARE THE
ULTIMATE IN APPEARANCE AND QUALITY**

"Like Cut Stone" best describes the appearance of these units in a few words. Architects specify them and builders buy them because they make better appearing walls. They are easier to align in walls because of their level tops, straight edges and perfect corners. This improvement in units has helped greatly to promote the wider use of concrete masonry in exposed walls.

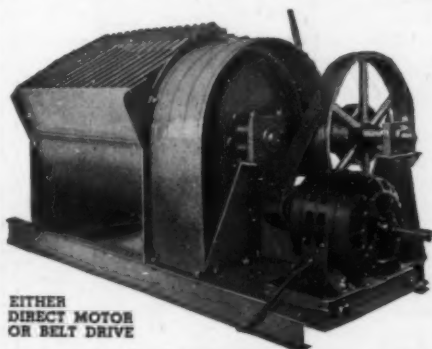
MAKING ONLY ONE SET OF PLAIN PALLET STRIPPERS

Further simplifying and refining Besser Plain Pallet Strippers made the FULLY PRESSED TOP possible. Only ONE SET OF PLAIN PALLETS is required to make any size, type or air space unit. This saves more than the price of the machine in the average plant, making an average number of units.



BESSER BATCH MIXERS

In All the Standard Capacities
5, 12, 18, 25, 30, 40 and 50 Cubic Feet



EITHER
DIRECT MOTOR
OR BELT DRIVE

BESSER PLAIN PALLET STRIPPERS

The Saving in Pallets Pays for a Besser Plain Pallet Stripper

FULLY AUTOMATIC—3 Models—Capacities: 2000 to 4000 units per day.

SEMI-AUTOMATIC—4 Models—Capacities: 1000 to 2000 units per day.

POWER OPERATED with Hand Controls—2 Models—Capacities: 500 to 1000 units per day.

MULTI-MOLD—Hand Operated—Capacities: up to 300 units per day. For manhole blocks, brick, slabs and small cored units.

AUTOMATIC BRICK MACHINES—Capacities from 10,000 to 50,000 units per day. For brick, slabs, coal cubes and other small units.

Besser Manufacturing Company are owners of all patents ever granted on concrete stripper block machines using plain pallets. These patents completely cover the basic Plain Pallet Stripper principle. No firm or individual is licensed or allowed to make machines under any of these patents.

BESSER MANUFACTURING CO.

COMPLETE EQUIPMENT FOR CONCRETE PRODUCTS PLANTS

Complete Sales and Service on BESSER, ANCHOR, CONSOLIDATED, IDEAL, HOBBS, UNIVERSAL, PORTLAND

203 38TH STREET

ALPENA, MICHIGAN

EVERY CONCRETE PRODUCTS PLANT NEEDS A BESSER PLAIN PALLET STRIPPER

NEW METHOD PAYS BIG PROFIT!

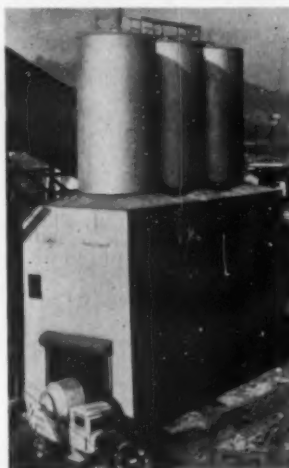
There's real profit ahead in Sand Lime Blocks for those producers who use the new JACKSON & CHURCH press! It makes sand lime blocks without use of pallets or racks. The special tampering features make it possible to produce blocks so they can be handled directly from the press at the rate of over 300 blocks an hour.

Write for complete details on how to be first in your city to capitalize on this new process.

JACKSON & CHURCH CO. SAGINAW MICHIGAN



The BROOKS-TAYLOR Lime Putty Plant



How would you like to supply 50 cu. yds. of brick mortar per day in addition to your present business? The Richter Concrete Corp. of Cincinnati delivered that much from the plant shown at the left for one job which totaled 3,500 cu. yds. Write our nearest office for information on a Brooks-Taylor plant to produce aged lime putty.

CHICAGO BRIDGE & IRON COMPANY

Plants at BIRMINGHAM, CHICAGO and GREENVILLE, PA.

Chicago.....2452 Old Colony Bldg.	Tulsa.....1650 Hunt Bldg.
New York.....3396-165 Broadway Bldg.	Houston.....2919 Main Street
Cleveland.....2265 Rockefeller Bldg.	Philadelphia.....1651-1700 Walnut St.
Detroit.....1553 LaFayette Bldg.	Boston.....1364 Consol. Gas Bldg.
Dallas.....1487 Liberty Bank Bldg.	San Francisco.....1093 Rialto Bldg.
Birmingham.....1505 N. 50th Street	Los Angeles.....1458 Wm. Fox Bldg.

MULTIPLEX

*for real economy
and finest blocks*

Every MULTIPLEX machine is built of highest quality material and designed for efficient, low cost production of high grade blocks. Fewer parts mean lower upkeep. No sprockets, chains, gears or clutches. Can be used for stripper or face-down blocks. Will handle concrete, cinders or any light weight aggregate with perfect satisfaction.

It feeds as it tamps and strikes the blow when needed.

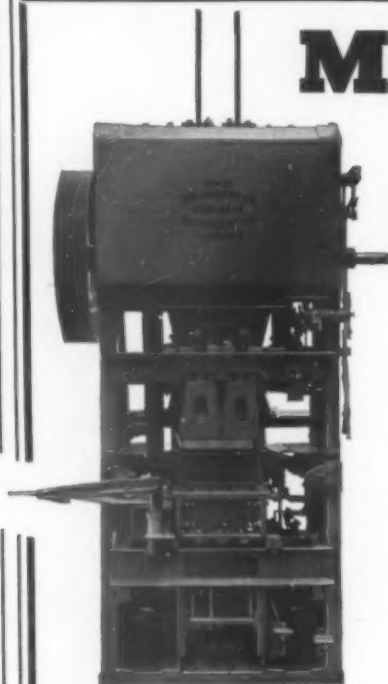
Sizes for every demand—from 400 to 3000 units per day of the 8"x8"x16" size and other sizes. Twenty different models

Write for complete details—Hand Machines, Double Strippers, Single Strippers, Tile Machines, Flue Block Machines, Random-Ashlar Machines, Brick Machines, Moulds, Forms, Power Machines, Power Presses, Power Tampers, Power Strippers, Super-Tampers, Mixers, Cars, Racks.

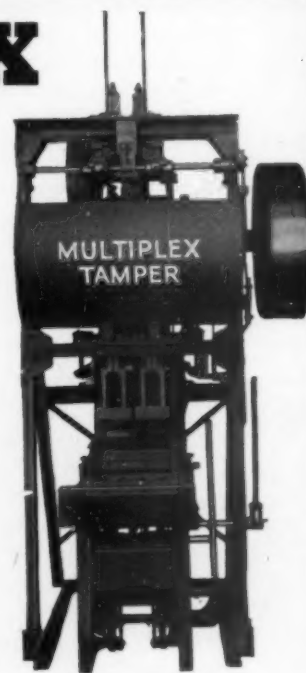
Complete machines installed.

**The MULTIPLEX
CONCRETE MACHINERY CO.**

ELMORE, OHIO



**SUPER
TAMPER**



**STANDARD
TAMPER**

Statistics

PORTLAND CEMENT INDUSTRY in January, 1938, produced 4,534,000 bbl., shipped 4,390,000, and had in stock at the end of the month 25,022,000, according to the Bureau of Mines. Production and shipments showed decreases of 31.5 and 6.4 percent, respectively, as compared with January, 1937. Stocks at mills were 2.6 percent higher than a year ago.

The factory value of the shipments from the mills in 1937 (114,010,000 bbl.) is estimated at \$169,807,000, representing an average value of \$1.49 per bbl.

According to the reports of producers, the shipments totals for 1937 include approximately 3,510,000 bbl. of high-early-strength portland cement with an estimated mill value of \$6,589,000.

The statistics here given are compiled from reports for January, received by the Bureau of Mines, from all manufacturing plants.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 160 plants at the close of January, 1937 and 1938.

RATIO (PERCENT) OF PRODUCTION TO CAPACITY

	January 1937	January 1938	Dec. 1937	Nov. 1937	Oct. 1937
The month...	30.4	20.7	32.2	43.7	52.0
The 12 months ended	44.9	44.5	45.3	46.0	46.7

Plants Down

UNIVERSAL ATLAS CEMENT CO., Chicago, Ill., is reported to have stopped production at its Independence, Kan., plant February 15, not to resume until about April 1. Shipments from stock continue.

PETOSKEY PORTLAND CEMENT CO., Petoskey, Mich., is down for the winter months; officials were quoted locally as saying production would be resumed about the last of April. Shipments from stock continue.

Sand-Lime Brick Production and Shipments

THE FOLLOWING DATA are compiled from reports received direct from producers of sand-lime brick located in various parts of the United States. They may be considered representative of the industry.

Nine active sand-lime brick plants reported for January and twelve for December, statistics for which were published in February.

Statistics for December and January

	Dec.†	Jan.‡
Production	1,671,850	545,410
Shipments (rail)	501,000	238,300
Shipments (truck)	1,365,199	859,460
Stock on hand	2,959,759	1,917,952
Unfilled orders	2,111,000	995,000

Average Prices for January

Shipping Point	Plant Price	Delivered Price
Detroit, Mich.	\$10.25	\$16.00
Mishawaka, Ind.	19.00	21.00 L/C
Syracuse, N. Y.	12.00	16.00 C/L
Saginaw, Mich.	10.90	15.00
Pontiac, Mich.	12.50	15.00
Milwaukee, Wis.	10.00	12.50

†Twelve plants reporting; incomplete, six not reporting unfilled orders and four not reporting stock on hand.

‡Nine plants reporting; incomplete, five not reporting unfilled orders and two not reporting stock on hand.

Concrete Pavement Yardage

Awards of concrete pavement for January, 1938, have been announced by the Portland Cement Association, as follows:

	Yardage Awarded During January, 1938
Roads	1,836,308
Streets	517,888
Alleys	21,683
Total	2,375,879

THE ROSS FEEDER

Completely controls the flow of any size material from Storage Bins, Hoppers or Open-Dump Chutes to Crushers, Conveyors, Screens, etc.

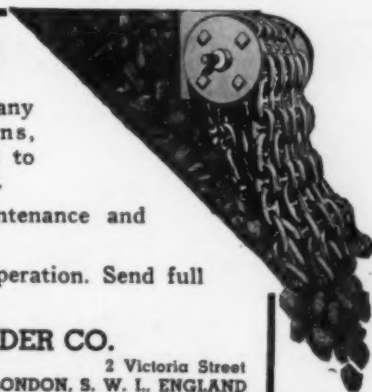
High in efficiency. Low in maintenance and power consumption.

Furnished in sizes to suit your operation. Send full particulars for recommendation.

ROSS SCREEN & FEEDER CO.

19 Rector Street
NEW YORK, U. S. A.

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LONDON, S. W. L, ENGLAND



Made of
Acid Open Hearth
Steel Wire

Round Strand
Flattened Strand
Preformed
Steel Clad
Non-Rotating

The Service Record of this wire rope continues to make and hold friends.

MADE ONLY BY

A. LESCHEN & SONS ROPE CO.
Established 1857

5909 Kennerly Avenue St. Louis, Mo.
New York — Chicago — Denver
San Francisco — Portland — Seattle

You can tell by looking at its lower sheave design that a

HI-POWER

is a bucket that will keep the closing line UP out of the muck, save jammed sheaves and move yardage at a profit.

It's a
REAL
Bucket
At a
RIGHT
Price



Ask for Bulletin 237 on Famous Hi-Power Clamshell Buckets

Write, Wire or Telephone

HAISS

George Hais Mfg. Co., Inc., Park Ave. & 143rd St., New York

Who, for over 40 years, have created and sold none but equipment of demonstrable superiority in design and manufacture.
PORTABLE BELT CONVEYORS — BUCKETS

MEMO—

"Send for Universal Vibrating Screen Catalog Today"

That is the first step. It will bring to your attention a line of Screens of the most improved and advanced design.

Here are Vibrating Screens at a sensible price—\$296 and up, that just cannot be beat for all around screening performance.

Remember—they
are **TRIED.—**
PROVED and
GUARANTEED.



**WRITE
TODAY!**

UNIVERSAL VIBRATING SCREEN CO.
RACINE — WISCONSIN



**DIXIE NON-CLOG
HAMMERMILLS and REGULAR
STATIONERY BREAKER**

Unexcelled for Primary, Secondary or Fine reduction.

Will reduce any material, wet, dry or sticky, to any given size in a single operation with absolute uniformity. Note particularly the moving breaker plate, an exclusive DIXIE feature, which provides 26 times the average wearing area and assures absolute freedom from clogging. 40 sizes to choose from.

Write for complete details.

DIXIE MACHINERY MFG. CO.
4109 Goodfellow Ave. ST. LOUIS, MO.



THE INDUSTRY

New Corporations

Asbestos Industries, Inc., has been incorporated at Wilmington, Del., to deal in asbestos cement products. Capitalization is 500 shares of no par value. Incorporators are George V. Relly, Edwin E. Lindgren, and Harold C. Vaughn, all of New York City.

Atlantic Lime Corp., Holly Hill, S. C., with executive offices in Charleston, S. C., has been incorporated with a capital stock of \$510,000 to deal in lime, mortars, cement, building material, etc. Officers include J. Innis McCants, president and treasurer; and R. W. Hanckel, secretary.

The Atlas Concrete Block Corp., 420 S. Dana Ave., Columbus, Ohio, has been issued a charter of incorporation to engage in the manufacture of concrete block, and to lay concrete floors, sidewalks and other concrete work. The capital stock is represented by 250 shares of no par value common. Incorporators include I. M. Harris, Mary E. Wright and Jack Kopperstein. Mr. Kopperstein, an architect and builder, is president; Mr. Harris is secretary, treasurer, and general manager; and James Whitesell is superintendent of production.

Fuller's Earth and Products Co., Laurel, Md., is the name of a new company incorporated by C. Albert Hodges and John A. Bromley.

Lawrence Stone and Gravel Co., Inc., Columbia, S. C., has been incorporated to mine, screen and sell gravel, ballast and sand; to crush rock and engage in engineering and construction. Capital stock is \$50,000. Officers of the company are W. R. Bonsal, Jr., president; George E. Dargan, vice president; and C. E. Coulson, secretary-treasurer.

Morgan Granite Co., Greensboro, N. C., is the name of a new corporation which will engage in mining any and all kinds of rock, sand, and gravel. The company is authorized to issue \$25,000 in stock. Incorporators are Homer Morgan, Cottle Morgan and Lottie Morgan, all of Greensboro, N. C.

The City Cement Block Co., Inc., 12 Chase St., Bridgeport, Conn., has received certificates of organization, and \$10,000 in stock has been subscribed. Officers are Christopher Monaco, president; Anna Monaco, treasurer; and Cevita Monaco, secretary; all of Bridgeport, Conn.

Roanoke Ready-Mix Concrete Corp., Roanoke, Va., has been incorporated with a maximum capitalization of \$50,000. A. V. Criss, Parkersburg, W. V., is president. Charles D. Fox, Jr., Roanoke, Va., is attorney for the company.

Pennsgrove Sand & Gravel Co., Camden, N. J., has filed incorporation papers. Authorized capital stock is \$100,000. Vincent L. Gallagher is agent.

Tacoma Asbestos Co., 102 S. 14th St., Tacoma, Wash., has been incorporated with a capital of \$5,000. Incorporators are Vic Johnson, E. J. Doherty, and E. F. Adams.

Salisbury Concrete Products Corp., Salisbury, Md., is a newly incorporated company formed to "buy, sell, and manufacture concrete blocks, bricks, cement and cinder machines, and other similar building materials and equipment." Incorporators and directors are Ralph E. Gordy, Lewis J. McBriety, and William W. Travers.

World's Best Slate Co., Bangor, Penn., has been incorporated with a capital of \$10,000. Incorporators are Philip Trigliani, Lila Hartzell, and Donato Maggese.

Manufacturers

Atlas Powder Co., Wilmington, Del., announces that J. H. Buchanan will have charge of a new sales office of the company located in the Field building, 135 South La Salle St., Chicago, Ill. The Chicago office will service the complete line of this com-

pany's industrial explosives and blasting supplies.

The Bucyrus-Erie Co., Milwaukee, Wis., recently appointed W. L. Hartley, 7031 W. Wisconsin Ave., Milwaukee, Wis., as representative of the company for the State of Wisconsin and Upper Michigan.

Worthington Pump and Machinery Corp., Harrison, N. J., has acquired an interest in the Moore Steam Turbine Corp., Wellsville, N. Y.

The Timken Roller Bearing Co., Canton, Ohio, reports that in addition to a representative selection of tapered roller bearings as used in all types of construction and road building equipment, the company displayed at the Southwest Road Show an operating model of the latest type of Timken fuel injection equipment for use on compression ignition engines.

Buell Engineering Co., Inc., New York, N. Y., announces the appointment of Joseph A. Messenger, formerly with United Engineers & Constructors, Inc., as general manager of the company. The Buell company is engaged in the manufacture of fly-ash eliminators, dust collecting systems and turbo dryers.

Federal Motor Truck Co., Detroit, Mich., is headed by a new president, R. W. Rudon, who for the past ten years has been vice-president and general manager. M. L. Pulcher, who served as president of the company since its formation in 1910, has announced his intention to retire from business.

General Electric Co., Schenectady, N. Y., has announced several important changes in official personnel. Stuart M. Crocker, vice-president of the International General Electric Co., has been appointed to the additional responsibilities of assistant to Charles E. Wilson, the new executive vice-president of the General Electric Co.; Edward F. Callahan, general manager of apparatus sales of the International General Electric Co., has been elected a vice-president of the company. John F. Cunningham has been appointed assistant to vice-president in charge of manufacturing. George Campbell, manager of the Schenectady local sales office, has assumed the added responsibilities of the management of the Syracuse office.

The Bucyrus-Erie Co., South Milwaukee, Wis., has moved its San Francisco offices from 989 Folsom St., to 390 Bayshore Blvd.

The Byers Machine Co., Ravenna, Ohio, announce the appointment of a new Pacific Coast representative, the Andrews Equipment Service, Portland, Ore., on their complete line of power shovels and cranes. W. D. Andrews is manager of the Andrews company, and J. M. Robinson is sales manager.

Carnegie-Illinois Steel Corp., 208 S. La Salle St., Chicago, Ill., reports a number of changes in the official staff. David F. Austin, manager of sales, Chicago district, succeeds C. V. McKaig as vice-president in charge of sales. Mr. McKaig was recently elected vice-president of United States Steel Corp., of Del. Thomas J. Hilliard, general manager of sales, succeeds J. Halsey McKown, as assistant vice-president and assistant general manager of sales. Mr. McKown becomes assistant vice-president of the Delaware corporation. Philip M. Guba has been made manager of sales of the Chicago district, succeeding Mr. Austin.

The B. F. Goodrich Co., Akron, Ohio, reports that there are now 1818 members in the company Twenty Year Service Club. At the recent semi-annual pin presentation ceremonial, 120 Akron employees were presented their 20-year emblems, and in addition there were 10 others in the nationwide field organization.

Robert W. Hunt Co., Engineers, Chicago, Ill., will celebrate its 50th Anniversary in 1938.

ROCK PRODUCTS

General Electric Co., Schenectady, N. Y., has announced the death of John A. Capp, engineer of materials in the Works Laboratory. He would have been 68 years of age on January 14, and was a veteran of more than 45 years' service with the company.

Hercules Powder Co., Wilmington, Del., has appointed Harry F. Kolb, of San Francisco, as director of purchases to succeed Ralph B. McKinney, who has been assigned to special duties with the Paper Makers Chemical Division of the company. Mr. Kolb, who has been closely associated with the purchasing departments of powder companies for a number of years, started in 1905 with the California Powder Works. In 1913, when Hercules took over the California company, he was named western purchasing agent, serving in that capacity until 1934 when he became assistant manager of the San Francisco office.

Lincoln Electric Co., Cleveland, Ohio, has announced the opening of a new sales office in Phoenix, Ariz., which will be in charge of R. J. Reardon. Mr. Reardon has had a wide experience in all branches of welding, having been connected with the Steel Tank & Manufacturing Co., Detroit; C. H. Patterson Co., as welding engineer and sales manager; Gilbert & Barker Manufacturing Co., as welding supervisor; and with American Metal Products Co., as welding engineer and supervisor.

Barney F. Devine, Chain Belt Co., Milwaukee, Wis., was re-elected chairman of the Mixer Manufacturers Bureau at the annual meeting in Cleveland during the American Road Builders Association Show. The Mixer Manufacturers Bureau is affiliated with the Associated General Contractors of America, Inc.

Carnegie-Illinois Steel Corp. has announced the appointment of G. Reed Schreiner as advertising manager. Mr. Schreiner, who has been assistant advertising manager of Carnegie-Illinois since organization of the company October 1, 1935, succeeds Charles R. Moffatt, recently appointed director of advertising of United States Steel Corp., of Delaware.

The Lincoln Electric Co., Cleveland, Ohio, announces the opening of a welding sales-engineering office at Atlanta, Ga., located at 412 Title building. Robert Daniels, a graduate electrical engineer with a wide experience in welding, will be in charge.

Bailey Meter Co., Cleveland, Ohio, has announced the assignment of nine cadet engineers to branch office duty. These men, school affiliation, and the district assignments are as follows: Paul Davenport—Penn State College—Philadelphia, Penn.; H. E. Eleniewski—Lafayette College—Buffalo, N. Y.; O. L. Garretson—Iowa State College—St. Louis, Mo.; H. R. Kroeger—Ohio State University—Denver, Colo.; F. M. Le Compte—University of Alabama—New York, N. Y.; H. R. Leuthy—Case School of Applied Science—Chicago, Ill.; T. O. Thompson—University of Missouri—Houston, Tex.; P. H. Vernor—Purdue University—Milwaukee, Wis.; and J. H. Dennis—Penn State College—Pittsburgh, Penn.

Equipment Corporation of America, Chicago, Ill., has announced that Marshall E. Jost, formerly sales engineer in the Chicago office, has been transferred to the Philadelphia office as district manager.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., reports several important changes in its publicity department. Effective January 15, the publicity department for power, electrical and industrial machinery now has two sections. A. K. Birch has been appointed assistant manager in charge of market analysis, sales organization service embracing price books, data and sales information, and the distribution of literature. George Callos has been appointed assistant manager in charge of sales promotion, including advertising, bulletins, exhibitions, house organs, etc.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has appointed Leon A. Watts to succeed the late Samuel Moore as general superintendent of the company's service and erecting department. During his many years of shop and field service experience, Mr. Watts has handled practically every line of equipment including cement mill machinery, large steam and hydro-electric power units, mining and electrical apparatus. He became assistant to Mr. Moore in 1935.

Gruendler Crusher and Pulverizer Co., St. Louis, Mo., announces the appointment of H. Blackwell to the sales department. Mr. Blackwell is located at the Chicago office, 205 W. Wacker Drive.

General Electric Co., Schenectady, N. Y., has announced the election of Nathan R. Birge as vice-president of the company. Mr. Birge was formerly assistant to the president, a position which he had held for the last ten years.

Goodyear Tire and Rubber Co., Akron, Ohio recently held a three-day sales meeting in New York at which plans for the coming year were discussed by the mechanical rubber goods division. Announcement was made of a scheduled increase in the advertising budget for 1938. R. S. Wilson, vice-president, said that although 1937 sales for the division hit an all time high, the company hoped to better the record in 1938.

The Linn Manufacturing Corp., Morris, N. Y., has announced the resignation of George Whitman as president and director of the company. F. R. Van Rensselaer, formerly vice-president, was elected president, and Philip W. Sloan, who has had a wide experience in the automotive field, succeeds Mr. Van Rensselaer as vice-president.

General Electric Co., Schenectady, N. Y., has announced the retirement on January 1, of Dr. Sanford A. Moss, mechanical engineer in the Thompson research laboratory, West Lynn, Mass., after 34 years of service.

The Marion Steam Shovel Co., Marion, Ohio, has announced the appointment of P. E. Piersol as manager of the Kansas City district. Mr. Piersol, who was formerly connected with the Texas district, is now located at 1231 Woodswether Road, Kansas City, Mo. The Kansas City district includes the states of Mo., Kan., Okla., Iowa, Neb., and Colo.

Chain Belt Co., Milwaukee, Wis., advises that John H. Holzbog, personnel director of the company, was recently honored with the presentation of the Milwaukee Junior Chamber of Commerce Distinguished Service Award. The award was given to Mr. Holzbog in recognition of his services in promoting industrial safety.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Penn., has promoted three executives in the industrial sales department of the company. C. F. Stroman, since 1931 manager of the industrial sales department, has been appointed assistant to the vice-president in charge of sales. C. B. Stainback, formerly assistant manager of the industrial sales department, becomes manager, and Bernard Lester, also a former assistant manager, has been made manager of a newly created resale department.

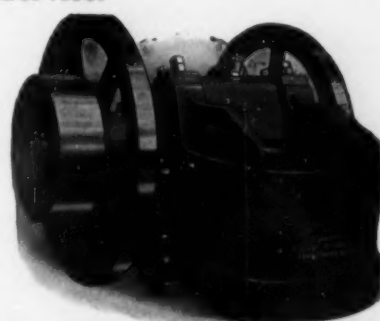
United States Steel Corp., of Delaware, Pittsburgh, Penn., has appointed Charles R. Moffatt as director of advertising, reporting to C. V. McKalg, vice president. Mr. Moffatt has been advertising manager of Carnegie-Illinois Steel Corp. since the organization of that company on October 1, 1935, and director of exhibits of United States Steel Corp. since July 1, 1935.

Plymouth Locomotive Works, division of The Fate-Root-Heath Co., Plymouth, Ohio, has appointed George Kirtley as sales manager of the locomotive division. Mr. Kirtley was formerly assistant to the vice president. Roy J. Johnson, formerly assistant chief engineer, has been named assistant sales manager of the locomotive division.

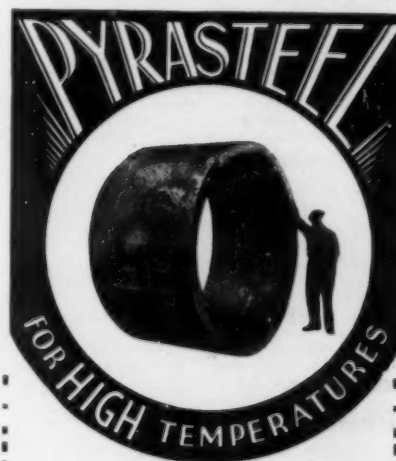
Hendrick Manufacturing Co., Pittsburgh, Penn., makers of perforated metals, is now located at a new address, room 744, Gulf Bldg.

B FARREL CON CRUSHERS

Complete Plants
Designed and
Equipped.
Screens, Elevators, Convey-
ors, Quarry, Sand and Gravel
Plant Equipment. Engineering
Service.



EARLE C. BACON, Inc.
17 John Street New York, N. Y.



Designed specifically for continuous service at high temperatures, PYRASTEEL is the ideal material for kiln ends.

This 7000 pound kiln end with a metal section of only 1/2" was in continuous service for six years at a temperature of 1950° F.

PYRASTEEL Kiln Ends make tight sealing possible and offer the most economical means of saving fuel.

Write for complete details.

CHICAGO STEEL FOUNDRY CO.

37th Street and Kedzie Ave.
CHICAGO, ILL.

Makers of Alloy Steel for over 25 years.

Macwhyte Co., Kenosha, Wis., recently held a three-day sales convention at the home offices. Tests of wire rope and other products were made in the laboratory for the benefit of the salesmen. Talks were made by Jessel S. Whyte, president; H. E. Sawyer, general sales manager; and A. B. Moseley, sales manager. George S. Whyte, founder and chairman of the board, in his address expressed the belief there would be increased activity in the wire rope industry during the coming year.

The B. F. Goodrich Co., Akron, Ohio, has announced that 15 employees who have been working 40 or more years with the company have formed the Forty-Year Group. The company was founded in 1870. A diamond-studded 40-year service pin has been awarded to each of these veteran employees.

Goodyear Tire & Rubber Co., Akron, Ohio, has created a new Cleveland, Ohio, district for the sale and distribution of mechanical rubber goods with headquarters in the company's tire sales district office. H. D. Foster has been appointed manager of the new Cleveland district, which includes Akron, Youngstown, Canton and the area bounded by those cities.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Penn., has appointed James Boyd to the position of eastern district manager with headquarters in New York City. Mr. Boyd succeeds H. F. Boe, who has become commercial manager of the company with offices in Pittsburgh.

Worthington Pump and Machinery Corp., Harrison, N. J., announces the appointment of W. A. Meiter to the position of manager of its Buffalo, N. Y., sales office. Mr. Meiter will succeed C. C. Scott, who will devote his time to special work in the Buffalo district.

The Timken Roller Bearing Co., Canton, Ohio, has appointed A. L. Bergstrom to the position of executive engineer to coordinate engineering activities of the company. Ernest Wooler, chief engineer, has resigned. Promotions in other divisions include: R. M. Riblet, chief engineer, automotive division; J. B. Baker, assistant chief engineer, automotive division, and chief engineer, rock bit division; S. M. Weckstein, chief engineer, industrial division; H. C. Edwards, chief engineer, fuel injection equipment division; W. C. Makley, chief works engineer, and E. J. Reagan, general service manager.

Fairbanks, Morse & Co. has moved its general offices to the modernized Fairbanks-Morse Bldg., 600 S. Michigan Ave., Chicago. A display room on the first floor will show various products manufactured.

Goodyear Tire & Rubber Co., Akron, Ohio, recently celebrated the 25th anniversary of the Mechanical Goods Division with a dinner at which four veterans were guests of honor. The veterans are W. M. "Pop" Metzler, 52 years in the rubber industry; Hal Campbell, 43 years; D. R. Burr, 43 years, and R. R. "Pop" Peebles, 31 years. All four joined Goodyear in 1913.

The Atlas Car and Manufacturing Co., Cleveland, Ohio, has reported the death on February 2nd of Samson D. Wright, president of the company. Mr. Wright was also president of The Atlas Bolt and Screw Co.

General Electric Co., Schenectady, N. Y., advises that Charles Waterman Stone, consulting engineer of the company, died on February 3 at the age of 63. Mr. Stone was for many years manager of the Central Station department, and was very much interested in radio and the application of thyatron tubes as an economical means of converting electricity from alternating to direct current and vice versa. He was at one time assistant to James G. Harbord, then president of Radio Corporation of America.

Caterpillar Tractor Co., Peoria, Ill., reports the death of G. E. Braddock, assistant advertising manager, who suffered a cerebral hemorrhage while on a business trip to Chicago and passed away after a 10-day illness.

Trade Literature

The following literature, recently published, is available free, upon request to the respective sponsor:

The Dorr Co., Inc., 570 Lexington Ave., New York, N. Y., has published an interesting brochure on the Westport Mill, Westport, Conn., where the Dorr organization maintains its laboratories and testing plant and many of the important developments in this company's equipment have been created. Originally, there was an old water-driven mill at this location. In 1917, the old mill and many acres of surrounding countryside were purchased by Mr. Dorr, and for a number of years the first laboratories and testing plant were located in the building. Several years ago the old mill was destroyed by fire and research facilities and personnel were located in temporary quarters. A new Westport Mill has arisen on the foundations of the old one where the latest laboratory and testing equipment has been installed for the Dorr Co.

Washing Equipment, Bulletin 1471-A, 15 pages, describes and illustrates blade mills, drum and mill type scrubbers, screw washers and dewaterers, log washers, revolving scrubber screens, and various types of vibrating screens made by ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis.

Rock Drills and associated equipment are described in detail in a profusely illustrated 80-page catalog recently issued. It is a virtual encyclopedia of rock drills, including jackhammers, paving breakers, drifters, stopehammers, wagon drills, jackbits, calyx and diamond drills, and also complete tabulations of operating and physical characteristics of drills and drilling tools together with eight pages of useful information such as metric conversion tables, friction of air in pipes and hose, horsepower required to compress given quantities of air to specified pressures, and compressor capacities. Copies of this catalog, No. 4201, are available from INGERSOLL-RAND CO., 11 Broadway, New York, N. Y.

Mining, Quarry and Gravel Pit Machinery is the title of a new 32-page catalog, Bulletin 266K, recently printed and made available for distribution by the SMITH ENGINEERING WORKS, Milwaukee, Wis.

"How to Handle Loads Safely" is a new 16-page booklet showing illustrations of braided wire rope slings used effectively for handling materials quickly and safely. This booklet may be obtained from MACWHYTE CO., Kenosha, Wis.

High-Capacity Screen Cloth of various specifications is described in Bulletin No. 544 recently made available by THE W. S. TYLER CO., Cleveland, Ohio.

Drills, water well, having many applications in quarry operations, are described and illustrated in a 24-page Bulletin No. 21-W-2. Copies may be obtained by addressing BUCYRUS-ERIE CO., South Milwaukee, Wis.

Electrical Equipment of interest to the rock products industry is described in four new bulletins. Modern Small Panel Instruments, GEA-2645, describes and illustrates ampere and volt meters; Modern Line-Breaker Equipment for mine and haulage locomotives, covers new line breaker equipment used in connection with drum controllers replacing hand-operated breaker and line fuse; Modern G-E Trolleys for Mine and Haulage Locomotives, GEA-2639; and Improved Frame Heads with labyrinth grease seals for mine and haulage locomotives, GEA-2642. These bulletins and further information regarding the equipment described may be obtained from the GENERAL ELECTRIC CO., Schenectady, N. Y.

Chains and Cables of various types and capacities are listed for ready reference in a 12-page booklet entitled, "Acco Products" which will fit in a desk file. The booklet may be obtained from the AMERICAN CHAIN & CABLE CO., INC., Bridgeport, Conn.

Screen operations of various kinds are described in bulletin SS-1, which is illustrated with views of vibrating screens. IOWA MANUFACTURING CO., Cedar Rapids, Ia.

Industrial Tires for material handling are described and illustrated in the 30-page Industrial Tire Handbook prepared by THE B. F. GOODRICH CO., Akron, Ohio.

Jaw Crushers is the title of a bulletin No. 264-D describing Teismith-Wheeling jaw crushers. Two new sizes, a 10x21 and a 24x36, are described and illustrated along with other products of the SMITH ENGINEERING WORKS, Milwaukee, Wis.

Vibrator Screens, roller bearing type, are shown in illustrations, together with specifications and other data, in bulletin D-37-B, recently issued by DIAMOND IRON WORKS, Inc., Minneapolis, Minn.

Excavators of various types are depicted performing different operations in a 32-page profusely illustrated catalog, No. 678, recently released by the KOEHRING CO., Milwaukee, Wis.

Detonating Fuse, of a new flexible type known as "Primacord", is illustrated and described in a 16-page booklet prepared and made available for distribution by THE ENSIGN-BICKFORD CO., Simsbury, Conn.

Tank Heads and Stamping to meet the different requirements of the industry are described and illustrated with color in a 27-page catalog now being distributed by THE COMMERCIAL SHEARING & STAMPING CO., Youngstown, Ohio.

Portable Conveyors, Self-Propelling "Motomove", and the applications of this equipment in industry are given in an illustrated booklet. This booklet also has data covering specifications of the equipment. The Model 75 Bucket Loader also is described and illustrated in bulletin 1037 prepared by GEORGE HAISS MFG. CO., INC., New York, N. Y.

Dump Bodies of various kinds and capacities are illustrated in a new 6-page, Bulletin No. 3, issued by GAR WOOD INDUSTRIES, INC., Detroit, Mich.

Shaft Hoists and Light Weight Stoppers are described and illustrated in two new bulletins prepared by the SULLIVAN MACHINERY CO., Claremont, N. H.

Insulating Materials for every industrial need, Form IN-55 A, is a 32-page catalog now available to the rock products industry. Several pages are devoted to the use of refractories by cement and lime plants. Copies of the catalog may be obtained from JOHNS-MANVILLE, New York, N. Y.

Concrete Mixers in three capacities; the 7-S, 2950 lb.; 10-S, 3950 lb.; and 14-S, 4975 lb.; are described and illustrated in a 12-page catalog now being distributed by the KOEHRING CO., Milwaukee, Wis.

Belt Conveyors and Bucket Elevators is the title of a new 124-page catalog, No. 47, profusely illustrated with views showing various applications of this equipment. It also contains mathematical formulas, diagrams, and other information to assist in working out various uses of conveying and elevating equipment. Copies of this catalog may be obtained from STEPHENS-ADAMSON MFG. CO., Aurora, Ill.

Low Cost Roads, Bulletin No. 25, is the title of an 85-page, profusely illustrated book, giving specifications, design of mixtures, construction, and maintenance practices of roads stabilized with aggregates, binder soil, and calcium chloride. This publication may be obtained by writing to the CALCIUM CHLORIDE ASSOCIATION, Detroit, Mich.

Crushers, Jaw and Roll, are illustrated and their operation and design explained in three bulletins issued by THE UNIVERSAL CRUSHER CO., Cedar Rapids, Iowa. Bulletin No. 100 covers bronze bearing jaw crushers; Bulletin No. 200 describes roller bearing jaw crushers.

Speed Reducers and Cut Gears of every description and for numerous applications are listed and illustrated, together with tabulations of dimensions, in a 184-page catalog recently issued by D. O. JAMES MANUFACTURING CO., Chicago, Ill.

"WE'RE FROM MISSOURI"

—what one marble company learned about AIR HOSE

TRUE citizens of the "show me" state are the Carthage Marble Corporation of Carthage, Missouri, world's largest producer of gray marble. Seeking the best air hose for their jack hammers, they tried many different makes in their quarries to see for themselves. Seven brands were tried out. Every hose met the same abuse from dragging and scraping over sharp rocks. Every hose was exposed to the full effect of oil in these line-lubricated hammers. Of these, six showed rapid wear in the cover and outside plies from cutting and abrasion, and excessive oil-deterioration—the best giving approximately 25 months' service with many shutdowns.

14 months longer wear

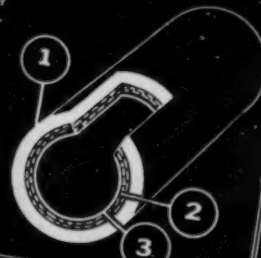
The seventh was a 1" Goodyear Emerald Cord Hose recommended by the G.T.M.—Goodyear Technical Man. Under identical conditions it lasted 3½ years—*more than 50% longer than any other make!* And in addition, production was increased and air cost reduced because Goodyear's air-tight, non-porous, oil-resistant construction prevents air seepage and flaking, insuring continuous full pressure at the toolheads.

That is why Goodyear Emerald Cord Air Hose is so widely used in heavy duty mine, quarry and construction work — *it lasts longer and saves money!* Why not talk over your hose requirements with the G.T.M.? To bring him to your office, write Goodyear, Akron, Ohio, or Los Angeles, California — or phone the nearest Goodyear Mechanical Rubber Goods Distributor.

THE GREATEST NAME IN RUBBER
GOODYEAR

-Specified
GOODYEAR STYLE M AIR DRILL HOSE
for heavy service in mines and quarries

- 1** Super-tough rubber cover that offers greater resistance to cutting, peeling and abrasion than wire-wound hose.
- 2** Heavy duck carcass that holds high pressures and absorbs "low-rope" strains.
- 3** Thick, slow-aging, non-swelling, oil-resisting, air-tight rubber tube.



**BELTS
MOLDED GOODS
HOSE
PACKING**

Made by the makers of
Goodyear Tires

Removing the over-burden
in the Carthage marble
quarries with Goodyear
Emerald Cord Air Hose.

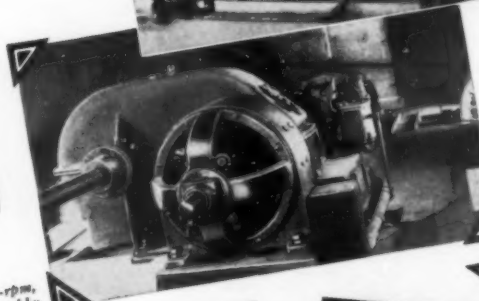
ELECTRICAL MAINTENANCE

Notes on trip to the Plant



One of four pulverized coal feeders and air blasts to kilns. G-E 30-hp induction motor drives fan and two G-E d-c motors drive coal feed screws.

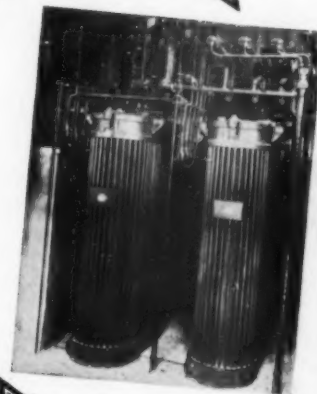
Three G-E 30-hp, 1500-rpm induction motors, with push-button control, driving slurry pumps.



G-E 175-hp, 600-rpm, d-c motor, operated by variable-voltage control, driving 100-ton freight car elevator.



Three G-E d-c motor-generator sets for excitation of synchronous motors for direct-current power. (Left) Main switchboard and control panels for operation of the principal motors in the plant.



Two G-E autotransformers for supplying reduced voltage for starting principal motors.

Some Interesting Facts about the Great Lakes Portland Cement Co. Plant is one of the largest in the country (8,000 barrels a day).

Raw material is all shipped from outside. Limestone comes by self-unloading boats from Rogers City, Mich.

All coal, limestone, shale, and gypsum is taken up 55 feet on huge elevators in 20-ton hopper cars.

Location near Niagara Falls means very cheap source of power.

One of the first cement plants to have centralized switchboard control of principal motors.

GENERAL

Index No. 153

ONLY 28¢ PER HP A YEAR



at Great Lakes' 100% G-E Equipped Plant

THAT is low maintenance, especially when you consider that 28 cents per

horsepower (labor and material) includes the upkeep of switchgear, control, and generators as well as of the 11,000 horsepower of motors in the 8,000-barrel-a-day, 4-kiln plant of the Great Lakes Portland Cement Company at Buffalo, N. Y.

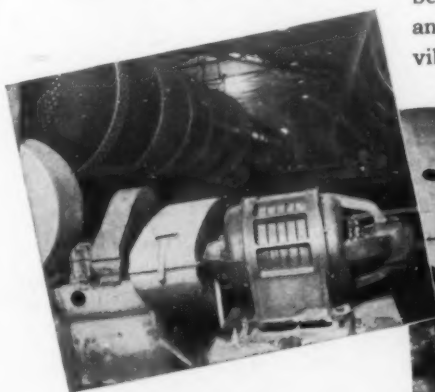
Furthermore, this figure was an average for the five years 1931-36, at the beginning of which period the equipment already had had five years of 24-hour-a-day, seven-day-a-week service.

Electric equipment doesn't have an easy time in a cement plant. There are plenty of hard jobs that must be done electrically, and plenty of dust and vibration, too.

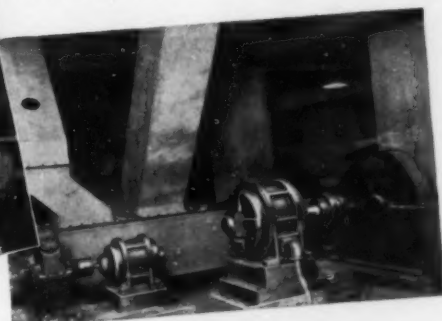
What factors have contributed to this low-maintenance record?

An important one is Great Lakes' well-organized maintenance department, which takes care of the equipment in a highly efficient manner. Another is the sturdiness and dependability of the G-E equipment. Again General Electric equipment — reliable, correctly engineered — is helping a rock-products plant to get low costs and continuous operation in the production of a high-grade cement for roads, dams, bridges, and other great construction projects.

For information as to how General Electric can help *you* with *your* electrical problems and thereby help you to get efficient, low-cost production in your plant, call our nearest representative. General Electric, Schenectady, N. Y.



G-E 100-hp 375/750-rpm wound-rotor motor driving one of the four 250-foot kilns.



Two G-E induction motors driving main and auxiliary screw conveyors under silos. There are four similar pairs in the plant.



E L E C T R I C

011-339

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 126

Admixtures (Aggregate)

Calcium Chloride Ass'n.

Aerial Tramways

American Cable Co.
Bethlehem Steel Co.
Broderick & Bascom Rope Co.
Leschen, A., & Sons Rope Co.
Macwhyte Co.
Roebblings, John A., Sons Co.

Aftercoolers (Air)

Chicago Pneumatic Tool Co.

Aggregates (Special)

Calcium Chloride Ass'n.
Tamm's Silica Co.
Universal Marble Products Corp.

Agitators

Allis-Chalmers Mfg. Co.
Hardinge Co.
Hetherington & Berner, Inc.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Air Compressors

Allis-Chalmers Mfg. Co.
Chicago Pneumatic Tool Co.
Fuller Co.
General Electric Co.
Nordberg Mfg. Co.
F. L. Smidth & Co.
Traylor Engineering & Mfg. Co.

Air Filters

Blaw-Knox Co.
Fuller Co.
Hardinge Co.
Roebblings, John A., Sons Co.
Western Precipitation Co.

Air Separators

Blaw-Knox Co.
Combustion Engr. Corp.
Hardinge Co.
Link-Belt Co.
Raymond Pulv. Div.
Smidth, F. L., & Co.
Sturtevant Mill Co.
Universal Road Machy. Co.
Western Precipitation Co.
Williams Patent Crusher & Pulv. Co.

Airveyors

Fuller Co.

Alloys (Metal)

American Manganese Steel Co.
Chicago Steel Foundry Co.

Ash & Refuse Handling Equip.

Allen-Sherman Hoff Co.
American Manganese Steel Co.
Hais, Geo., Mfg. Co.
Hetherington & Berner, Inc.
Jeffrey Mfg. Co.
Robins Conveying Belt Co.

Asphalt Heaters

Easton Car & Construction Co.

Asphalt Mixer Regulators

Hetherington & Berner, Inc.

Asphalt Mixing Plants

Hetherington & Berner, Inc.
Traylor Engineering & Mfg. Co.

Axles

Eagle Iron Works

Babbitt Metal

Allis-Chalmers Mfg. Co.
Dixie Machy. Mfg. Co.
Ryerson, Jos. T., & Son, Inc.

Backdiggers

Bay City Shovels, Inc.
Link-Belt Co.

Backfillers

Bucyrus-Erie Co.
Link-Belt Co.
Thew Shovel Co.

Bag Cleaning Machines

Link-Belt Co.

Bag Ties (Wire)

Wickwire-Spencer Steel Co.

Bagging Machines

Smidth, F. L., & Co.

Balers (Sack)

Besser Mfg. Co.

Balls (Grinding)

Allis-Chalmers Mfg. Co.
Carnegie-Illinois Steel Corp.
(United States Steel Corp. Subsidiary)
Hardinge Co.
Jeffrey Mfg. Co.
F. L. Smidth & Co.
Traylor Engineering & Mfg. Co.

Barges

Chicago Bridge & Iron Co.
Eagle Iron Works

Batchers, Measuring Volume

Besser Mfg. Co.
Fuller Company
Jaeger Machine Co.

Batteries

Goodyear Tire & Rubber Co.

Battery Chargers

General Electric Co.

Bearing Metals

Allis-Chalmers Mfg. Co.

Bearings (Anti-Friction)

Eagle Iron Works
Hetherington & Berner, Inc.
Jeffrey Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Ryerson, Jos. T., & Sons, Inc.
SKF Industries, Inc.
Standard Pressed Steel Co.
Timken Roller Bearing Co.

Bearings (Ball)

SKF Industries, Inc.

Bearings (Roller and Tapered Roller)

SKF Industries, Inc.
Timken Roller Bearing Co.

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SKF Industries, Inc.
Timken Roller Bearing Co.

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Barber-Greene Co.
Goodyear Tire & Rubber Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.

Belt (Metal)

Wickwire-Spencer Steel Co.

Belt (Transmission)

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Gilmer, L. H., Co.
Goodyear Tire & Rubber Co.
Hais, Geo., Mfg. Co.
Link-Belt Co.
Smidth, F. L., & Co.

Belt (V Type)

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Gilmer, L. H., Co.
Goodyear Tire & Rubber Co.
Link-Belt Co.

Belt (Wire)

Wickwire-Spencer Steel Co.

Belt Fasteners

Flexible Steel Lacing Co.
Robins Conveying Belt Co.

Belt Idlers

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Jeffrey Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Smith Engineering Wks.

Belt Lacing

Flexible Steel Lacing Co.

Belt Tighteners

Robins Conveying Belt Co.

Belt Trippers

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McLanahan & Stone Corp.
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Universal Road Machy. Co.

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Ensign-Bickford Co.

Blasting Supplies

Ensign-Bickford Co.

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Besser Mfg. Co.
Multiplex Concrete Machy. Co.
R & L Concrete Machy. Co.

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Robins Conveying Belt Co.
SKF Industries, Inc.
Standard Pressed Steel Co.
Timken Roller Bearing Co.

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Roebblings, John A., Sons Co.
Sauerman Bros.

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Jeffrey Mfg. Co.

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Robins Conveying Belt Co.

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Combustion Engineering Corp.

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R & L Concrete Machinery Co.

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Bucyrus-Erie Co.
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Jaeger Machine Co.
Link-Belt Co.
Owen Bucket Co.
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Buckets (Dragline and Slack-line)

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Bay City Shovels, Inc.

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Blaw-Knox Co.
Bucyrus-Erie Co.
Hayward Company
Hendrick Mfg. Co.
Link-Belt Co.
Owen Bucket Co.
Sauerman Bros., Inc.

Buckets (Dredge & Excavator)

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Hais, Geo., Mfg. Co.
Hayward Co.
Owen Bucket Co.

Buckets (Elevator and Conveyor)

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Cross Engineering Co.
Hais, Geo., Mfg. Co.
Hendrick Mfg. Co.
Industrial Brownhoist Corp.
Jaeger Machine Co.
Jeffrey Mfg. Co.
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Bulldozers

Bucyrus-Erie Co.

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Leschen, A., & Sons Rope Co.
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Calcium Chloride

Calcium Chloride Ass'n.

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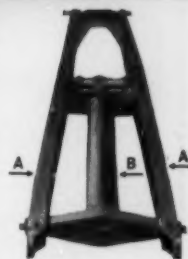
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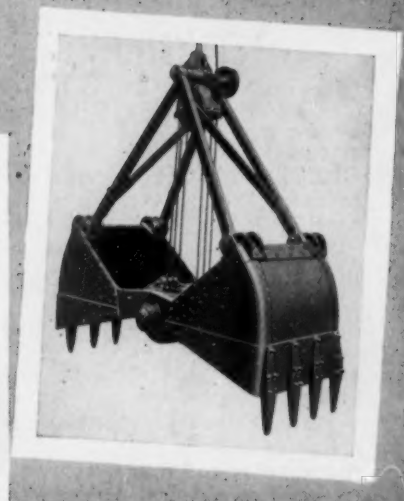
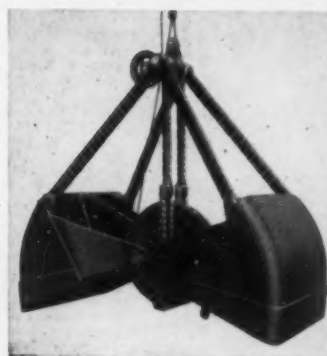
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Eagle Iron Wks.
Hetherington & Berner, Inc.

Dredge Hulls

Chicago Bridge & Iron Co.
Eagle Iron Wks.

Dredge Pumps

Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Birdsboro Steel Fdry. & Mach.
Co.
Buchanan, C. G., Co., Inc.
Bucyrus-Erie Co.
Hetherington & Berner, Inc.
Jaeger Machine Co.
Morris Machine Wks.
Wilfley, A. R., & Sons, Inc.

Dredging Sleeves

Hetherington & Berner, Inc.

Drills (Rock)

Bucyrus-Erie Co.
Chicago Pneumatic Tool Co.
Jeffrey Mfg. Co.
Timken Roller Bearing Co.

Drills (Well)

Bucyrus-Erie Co.

Drill Bits

Bucyrus-Erie Co.
Chicago Pneumatic Tool Co.
Timken Roller Bearing Co.

Drill Sharpening Machines

Bucyrus-Erie Co.

Drill Steel

Bethlehem Steel Co.
Chicago Pneumatic Tool Co.

Drilling

Chicago Pneumatic Tool Co.

Drilling Accessories

Bucyrus-Erie Co.
Chicago Pneumatic Tool Co.
Timken Roller Bearing Co.

Drives (Belt, Chain and Rope)

Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Smidth, F. L., & Co.

Drives (Short Center)

Allis-Chalmers Mfg. Co.
Earle C. Bacon, Inc.
Link-Belt Co.
Smidth, F. L., & Co.

Drives (Worm)

Link-Belt Co.

Dryers

Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Combustion Engineering Corp.
Hardinge Co.
Hetherington & Berner, Inc.
Jeffrey Mfg. Co.
Lewistown Foundry & Mach.
Co.
Link-Belt Co.
McLanahan & Stone Corp.
Raymond Pulverizer Division
Smidth, F. L., & Co.
Traylor Engineering & Mfg.
Co.
Western Precipitation Co.
Williams Patent Crusher &
Pulv. Co.

Dust Collecting Systems

Allen Sherman Hoff Co.
Allis-Chalmers Mfg. Co.
Blaw Knox Co.
Chicago Bridge & Iron Co.
Hendrick Mfg. Co.
Raymond Pulverizer Division

Smidth, F. L., & Co.
Western Precipitation Co.

Dust Conveying Systems

Allen-Sherman-Hoff Co.
Blaw-Knox Co.
Fuller Company
Western Precipitation Co.

Dust Precipitators

Western Precipitation Co.

Dust Collector Bags

Blaw-Knox Co.

Dust Recovery Plants

Western Precipitation Co.

Dynamite

duPont, E. I., de Nemours Co.

Elevators

Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Barber-Greene Co.
Besser Mfg. Co.
Eagle Iron Works
Fuller Company
Hais, Geo., Mfg. Co.
Hendrick Mfg. Co.
Industrial Brownhoist Corp.
Jaeger Machine Co.
Jeffrey Mfg. Co.
Lewistown Foundry & Mach.
Co.

Link-Belt Co.

McLanahan & Stone Corp.
Multiplex Concrete Mach. Co.
New Holland Machine Co.
Robins Conveying Belt Co.
Smidth, F. L., & Co.
Smith Engineering Works
Sturtevant Mill Co.
Traylor Engineering & Mfg.
Co.
Universal Road Machy. Co.
Williams Patent Crusher &
Pulv. Co.

Engines

Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Birdsboro Steel Fdry. & Mach.
Co.
Blaw-Knox Co.
Buchanan, C. G., Co., Inc.
Cross Engr. Co.
Fuller Co.
Hetherington & Berner, Inc.
Jeffrey Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Morris Machine Works
Productive Equipment Corp.
Robins Conveying Belt Co.
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg.
Co.
Williams Patent Crusher &
Pulv. Co.

Engines (Diesel, Gasoline, Kero- sene and Oil)

Allis-Chalmers Mfg. Co.
Chicago Pneumatic Tool Co.
New Holland Machine Co.
Nordberg Mfg. Co.

Engines (Natural Gas)

Allis-Chalmers Mfg. Co.

Engines (Steam)

Allis-Chalmers Mfg. Co.
Morris Machine Works
Nordberg Mfg. Co.

Exhauster

Combustion Engineering Co.
Raymond Pulverizer Division

Explosives

duPont, E. I., de Nemours Co.

Fans (Exhaust)

Blaw-Knox Co.
General Electric Co.
Jeffrey Mfg. Co.
Smidth, F. L., & Co.

Feeders

Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Earle C. Bacon, Inc.
Barber-Greene Co.
Besser Mfg. Co.
Blaw-Knox Co.
Fuller Co.
Hardinge Co.
Hetherington & Berner, Inc.
Jeffrey Mfg. Co. (Pan & Tube)
Link-Belt Co.
Pennsylvania Crusher Co.
Robins Conveying Belt Co.
Ross Screen & Feeder Co.
Smidth, F. L., & Co.
Smith Engr. Wks.
Traylor Engineering & Mfg.
Co.
Universal Road Machy. Co.

Classified Directory—Continued

Fence (Wire)
Bethlehem Steel Co.
Roebbing's, John A., Sons Co.
Wickwire-Spencer Steel Co.

Fence Posts
Wickwire-Spencer Steel Co.

Filter Cloth
Roebbing's, John A., Sons Co.
Tyler, W. S., Co.
Wickwire-Spencer Steel Co.

Floor Sweeping Systems (Hydro Vacuum)
Allen-Sherman Hoff Co.

Forgings
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.

Fuels (Diesel)
Texas Co.

Fuses (Detonating and Safety)
Ensign-Bickford Co.

Fuses (Electric)
General Electric Co.

Fuse Cutters
Ensign-Bickford Co.

Fuse Lighters
Ensign-Bickford Co.

Galvanometers
General Electric Co.

Gaskets
Goodyear Tire & Rubber Co.

Gasoline
Gulf Refining Co.
Texas Company

Gears
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Birdsboro Steel Fdry. & Mach. Co.
Buchanan, C. G. Co., Inc.
General Electric Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.

Generators & Motor Generator Sets
Allis-Chalmers Mfg. Co.
General Electric Co.
Nordberg Mfg. Co.

Glass Sand Equipment
Lewistown Fdry. & Mach. Co.

Grapples
Blaw Knox Co.
Bucyrus-Erie Co.
Hayward Co.
Owen Bucket Co.

Grease
Bacon, Earle C., Co.
Gulf Refining Co.
Texas Company

Grease Cups
Link-Belt Co.
Robins Conveying Belt Co.

Guards (Lamp)
Flexible Steel Lacing Co.

Guards (Machinery)
Harrington & King Perforating Co.
Tyler, W. S., Co.

Guns (Hydraulic)
Hetherington & Berner, Inc.
Morris Machine Works

Gypsum Plants
Traylor Engr. & Mfg. Co.

Haulage Systems (Electric)
General Electric Co.
Jeffrey Mfg. Co.

Haulage Systems (Remote Control)
General Electric Co.

Hoists
Allis-Chalmers Mfg. Co.
Besser Mfg. Co.
Chicago Pneumatic Tool Co.
Commercial Shearing & Stamping Co.
Eagle Iron Works
Hetherington & Berner, Inc.
Jaeger Machine Co.
Jeffrey Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Nordberg Mfg. Co.
Northwest Engineering Co.
Robins Conveying Belt Co.
Sauerman Bros., Inc.
Smith Engr. Wks.
Traylor Engineering & Mfg. Co.
Universal Road Machy. Co.

Hoppers
Besser Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.

Hardinge Co.
Hendrick Mfg. Co.
Jaeger Machine Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.
Universal Road Machy. Co.

Hose (Water, Steam, Air, Drill, Pneumatic, Sand Suction and Discharge)
Chicago Pneumatic Tool Co.
Dixie Machinery Mfg. Co.
Hetherington & Berner, Inc.
Jaeger Machine Co.
Morris Machine Works

Hose Clamps
Chicago Pneumatic Tool Co.

Hose Couplings
Chicago Pneumatic Tool Co.

Hydrators
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Hardinge Co.
Traylor Engr. & Mfg. Co.

Jigs (Sand and Gravel)
Allis-Chalmers Mfg. Co.
Hardinge Co.
Traylor Engineering & Mfg. Co.

Joist & Slab Machines (Concrete)
R & L Concrete Machy. Co.

Kilns Parts
Allis-Chalmers Mfg. Co.
Birdsboro Steel Fdry. & Mach. Co.
Blaw-Knox Co.
Buchanan, C. G. Co., Inc.
Chicago Steel Foundry Co.
Hardinge Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Kilns (Rotary)
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Hardinge Co.
F. L. Smidth & Co.
Traylor Engineering & Mfg. Co.

Kilns (Shaft)
Hardinge Co.

Kilns (Vertical)
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Hardinge Co.

Kiln Burners
Smidth, F. L., & Co.

Kiln Chain Systems
Smidth, F. L., & Co.

Kiln Liners (Metal)
Hardinge Co.
Traylor Engr. & Mfg. Co.

Kominuters
Smidth, F. L., & Co.

Laoratory Apparatus
Smidth, F. L., & Co.

Lime Handling Equipment
Chicago Bridge & Iron Co.
Fuller Co.
Hardinge Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Raymond Pulv. Div.
Robins Conveying Belt Co.

Lime Plants
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Hardinge Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.

Lime Putty Plants
Chicago Bridge & Iron Co.

Loaders (Car, Truck & Bin)
Barber-Greene Co.
Besser Mfg. Co.
Bucyrus-Erie Co.
Fuller Company
Geo. Hais Mfg. Co., Inc.
Jeffrey Mfg. Co.
Link-Belt Co.
New Holland Machine Co.
Northwest Engineering Co.
Robins Conveying Belt Co.
Ross Screen & Feeder Co.
Universal Road Machy. Co.

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Link-Belt Co.

Loaders (Box Car)
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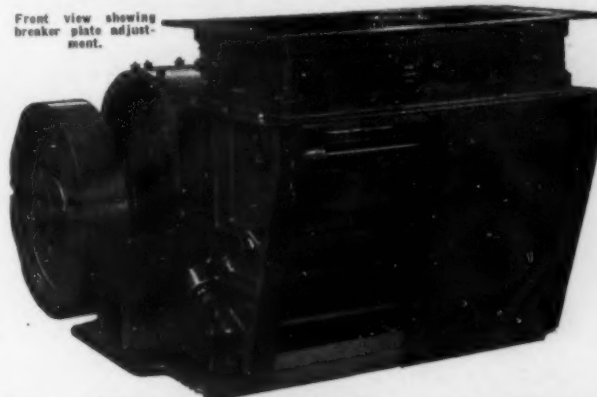
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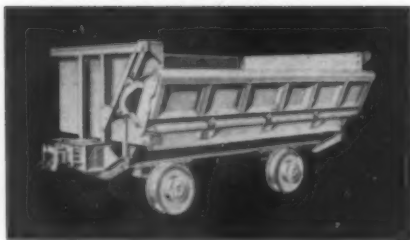
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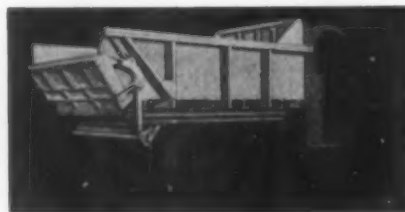
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Allis-Chalmers Mfg. Co.
Bay City Shovels, Inc.
Jeffrey Mfg. Co.
Nordberg Mfg. Co.
Thew Shovel Co.
- Locomotives (Diesel and Diesel-Electric)**
Davenport-Besler Corp.
Lima Locomotive Wks.
- Locomotives (Electric, Trolley & Storage Battery)**
Davenport-Besler Corp.
General Electric Co.
Jeffrey Mfg. Co.
Lima Locomotive Wks., Inc.
- Locomotives (Gasoline and Gas-Electric)**
Davenport-Besler Corp.
Jeffrey Mfg. Co.
Lima Locomotive Wks., Inc.
- Locomotives (Kerosene)**
General Electric Co.
Lima Locomotive Wks., Inc.
- Locomotives (Oil & Oil-Electric)**
General Electric Co.
Lima Locomotive Wks., Inc.
- Locomotives (Steam)**
Davenport-Besler Corp.
Lima Locomotive Wks., Inc.
- Lubricants**
Bacon, Earle C., Co.
Chicago Pneumatic Tool Co.
Gulf Refining
Robins Conveying Belt Co.
Texas Company
- Manganese Steel Parts**
American Manganese Steel Co.
Bacon, Earle C., Inc.
- Magnetic Separators**
Birdsboro Steel Fdry. & Mach. Co.
Buchanan, C. G., Co., Inc.
- Magnets**
General Electric Co.
- Material Handling Equipment**
Allen-Sherman-Hoff Co.
Barber-Greene Co.
Fuller Company
Hardinge Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Raymond Pulverizer Division
Robins Conveying Belt Co.
- Measuring Devices**
Blaw-Knox Co.
General Electric Co.
Hardinge Co.
- Mechanical Rubber Goods**
Goodyear Tire & Rubber Co.
- Mill Parts**
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Hardinge Co.
Smidth, F. L., & Co.
Traylor Engineering & Mfg. Co.
- Mills, Grinding (Ball, Tube, Hammer, Rod, Roll, Etc.) (See also Pulverizers)**
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Birdsboro Steel Fdry. & Mach. Co.
Buchanan, C. G., Co., Inc.
Dixie Machinery Mfg. Co.
Hardinge Co.
Jackson & Church Co.
Jeffrey Mfg. Co.
Lewistown Foundry & Mach. Co.
Pennsylvania Crusher Co.
Raymond Pulverizer Division
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Williams Patent Crusher & Pulv. Co.
- Mill Liners**
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subs.)
Hardinge Co.
Jeffrey Mfg. Co.
Smidth, F. L., & Co.
Traylor Engr. & Mfg. Co.
- Mortar Mixers**
Eagle Iron Works
Jaeger Machine Co.
- Mortar Colors**
Mepharm, Geo. S., Corp.
Tamm's Silica Co.
- Motors (Electric)**
Allis-Chalmers Mfg. Co.
General Electric Co.
- Motor Starters**
Allis-Chalmers Mfg. Co.
General Electric Co.
- Nozzles (Gravel Washing)**
Link-Belt Co.
- Nuts**
Bethlehem Steel Co.
Standard Pressed Steel Co.
- Ornamental Forms (Concrete)**
Besser Mfg. Co.
- Packings**
Goodyear Tire & Rubber Co.
- Pallets**
Anchor Concrete Machinery Co.
Bacon, Earle C., Inc.
Lessor Mfg. Co.
Commercial Shearing and Stamping Co.
Flam, Stephan
Multiplex Concrete Machy Co.
- Pans, Grinding (Wet & Dry)**
Eagle Iron Works
Jackson & Church Co.
Traylor Engineering & Mfg. Co.
- Perforated Metal**
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Chicago Perforating Co.
Cross Engineering Co.
Harrington & King Perf. Co.
Hendrick Mfg. Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Joseph T. Ryerson & Son, Inc.
Traylor Engr. & Mfg. Co.
Wickwire-Spencer Steel Co.
- Pinions**
Bacon, Earle C., Inc.
General Electric Co.
Halss, Geo., Mfg. Co.
Jeffrey Mfg. Co.
Link-Belt Co.
- Pipe Molds and Machines (Concrete)**
Reamer Mfg. Co.
Quinn Wire & Iron Works
R & L Concrete Machinery Co.
- Pipe**
Bethlehem Steel Co.
Chicago Bridge & Iron Co.
Hetherington & Berner, Inc.
Morris Machine Works
- Pipe Couplings**
Chicksan Oil Tool Co., Ltd.
- Pipe Joints**
Chicksan Oil Tool Co., Ltd.
- Plaster Colors**
Mepharm, Geo. S., Corp.
- Pontoons**
Chicago Bridge & Iron Co.
Eagle Iron Works
Morris Machine Works
- Powder (Blasting)**
duPont, E. I., de Nemours Co.
- Pulleys**
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Birdsboro Steel Fdry. & Mach. Co.
Buchanan, C. G., Co., Inc.
Jeffrey Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
- Pulverizer Parts**
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Dixie Machinery Mfg. Co.
Hardinge Co.
Jeffrey Mfg. Co.
Smidth, F. L., & Co.
- Pulverizers (Hammer, Ring, Rod & Roll) (See Also Mills & Crushers)**
Allis-Chalmers Mfg. Co.
American Pulverizer Co.
Birdsboro Steel Fdry. & Mach. Co.
Blaw-Knox Co.
Buchanan, C. G., Co., Inc.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subs.)
Combustion Engr. Corp.
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Hardinge Co.
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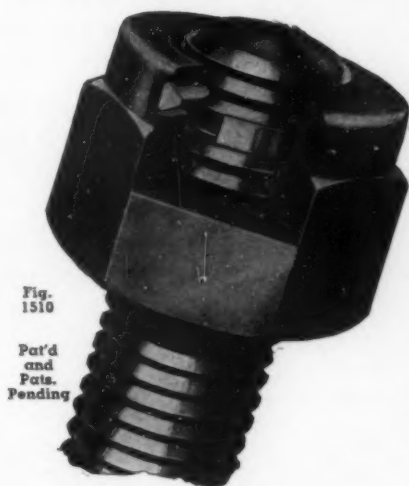


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Raymond Pulverizer Division
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Sturtevant Mill Co.
Traylor Engineering & Mfg. Co.
Universal Road Machy. Co.
Williams Patent Crusher & Pulv. Co.

Pumps (Centrifugal)
Allen Cone & Machy. Corp.
Allen-Sherman Hoff Co.
Allis-Chalmers Mfg. Co.
Hetherington & Berner, Inc.
Jaeger Machine Co.
Morris Machine Works
A. R. Wilfley & Sons

Pumps (Deep Well)
Chicago Pneumatic Tool Co.
Morris Machine Wks.

Pumps (Diaphragm)
Hardinge Co.
Jaeger Machine Co.

Pumps (Pulverized Material)
Fuller Company
Morris Machine Works
Smidth, F. L., & Co.

Pumps (Vacuum)
Allis-Chalmers Mfg. Co.
Chicago Pneumatic Tool Co.
Fuller Company
Smidth, F. L., & Co.

Pump Valves (Pulverized Material)
Fuller Co.

Racks (Curing)
Besser Mfg. Co.
Multiplex Concrete Mach. Co.

Rails
Bethlehem Steel Co.

Railway Equipment
General Electric Co.

Railways (Electric)
General Electric Co.

Rectifiers
Allis-Chalmers Mfg. Co.
General Electric Co.

Recuperators
Traylor Engineering & Mfg. Co.

Refractories
Smidth, F. L., & Co.

Regulators (Voltage)
Allis-Chalmers Mfg. Co.
General Electric Co.

Rewashers (Screw)
Link-Belt Co.
Smith Engineering Works

Roofing
Ryerson, Jos. T., & Son, Inc.
Texas Co.

Rope (Transmission)
Allis-Chalmers Mfg. Co.

Sand Drags
Eagle Iron Wks.
Jeffrey Mfg. Co.
Link-Belt Co.
Smith Engr. Wks.

Sand and Gravel Plants
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Eagle Iron Works

Hardinge Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Traylor Engineering & Mfg. Co.

Sand Lime Brick Machinery
Hardinge Co.
Jackson & Church Co.
Jeffrey Mfg. Co.

Sand Separators
Jeffrey Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Smith Engineering Wks.

Sand Settling Tanks
Allen Cone & Machy. Co.
Chicago Bridge & Iron Co.
Eagle Iron Wks.
Hardinge Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Nordberg Mfg. Co.
Smith Engr. Wks.

Scales (Conveyor)
Merrick Scale Co.

Scales (Hopper)
Blaw-Knox Co.
Merrick Scale Co.

Scales (Truck & Track)
Hardinge Co.
Merrick Scale Co.

Scrapers (Power Drag)

Blaw-Knox Co.
Bucyrus-Erie Co.
Hayward Company
Jeffrey Mfg. Co.
Link-Belt Co.
Northwest Engineering Co.
Sauerman Bros., Inc.

Screen Parts

Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Hardinge Co.
Hendrick Mfg. Co.
Screen Equipment Co.
Traylor Engineering & Mfg. Co.
Wickwire-Spencer Steel Co.

Screens (Grizzly)

Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Eagle Iron Works
Hendrick Mfg. Co.
Jeffrey Mfg. Co.
Lewistown Foundry & Mach. Co.
Link-Belt Co.
Productive Equipment Corp.
Robins Conveying Belt Co.
Roebbing's, John A., Sons Co.
Ross Screen & Feeder Co.
Smith Engineering Works
Traylor Engineering & Mfg. Co.
Tyler, W. S., Co.
Universal Road Machy. Co.
Universal Vibrating Screen Co.

Screens (Laboratory)

Allis-Chalmers Mfg. Co.
Hardinge Co.
Hendrick Mfg. Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Roebbing's, John A., Sons Co.
Smidth, F. L., & Co.
Tyler, W. S., Co.
Wickwire-Spencer Steel Co.
Williams Patent Crusher & Pulv. Co.

Screens (Revolving)

Allis-Chalmers Mfg. Co.
Bacon, Earle C., Inc.
Eagle Iron Wks.
Hais, Geo., Mfg. Co., Inc.
Hardinge Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.
Roebbing's, John A., Sons Co.
Smith Engr. Wks.
Traylor Engr. & Mfg. Co.
Tyler, W. S., Co.
Universal Road Machy. Co.

Screens, Scalping

Allis-Chalmers Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Smith Engineering Works
Williams Patent Crusher & Pulv. Co.

Screens (Trommel)
Traylor Engr. & Mfg. Co.

Screens (Vibrating)

Allen Cone & Machy. Corp.
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Eagle Iron Works
Hardinge Co.
Hendrick Mfg. Co.
Jeffrey Mfg. Co.
Lewistown Fdry. & Mach. Co.
Link-Belt Co.
McLanahan & Stone Corp.
New Holland Machine Co.
Nordberg Mfg. Co.
Robins Conveying Belt Co.
Screen Equipment Co.
Smith Engineering Works
Sturtevant Mill Co.
W. S. Tyler Co.
Universal Vib. Screen Co.
Wickwire-Spencer Steel Co.
Williams Patent Crusher & Pulv. Co.

Screws (Cap, Self Locking, Set, Hollow Set)
Standard Pressed Steel Co.

Seal Rings

Traylor Engineering & Mfg. Co.

Semi-Trailers

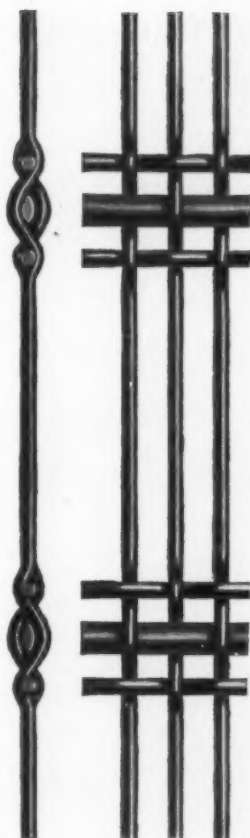
Easton Car & Const. Co.

Shafting

Allis-Chalmers Mfg. Co.
Bacon, Earle C., Inc.
Jeffrey Mfg. Co.
Link-Belt Co.

Shale Planers

Eagle Iron Wks.



STA-TRU

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Woven Wire Screens

made to work under tension and vibration.

The straight stay-bars carry ALL the tension. The crimps in the round wires can not be stretched or broken. The screen can not be caused to sag or split by the pull of the tensioning device.

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SAYLOR**

WIRE CO. ST. LOUIS

for Joining and Repairing CONVEYOR BELTS

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BELT FASTENERS



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FLEXCO HD BELT FASTENERS make a tight butt joint of great strength and long life. Recessed plates embed in belt, compress belt ends and prevent ply separation. Five sizes in steel and alloys.

FLEXCO HD RIP PLATES are used in repairing rips and patching conveyor belts. The added width gives a desirable long grip on the edges of the rip. Consultation on belt joining and repair invited. Sold through jobbers and belting houses the world over.

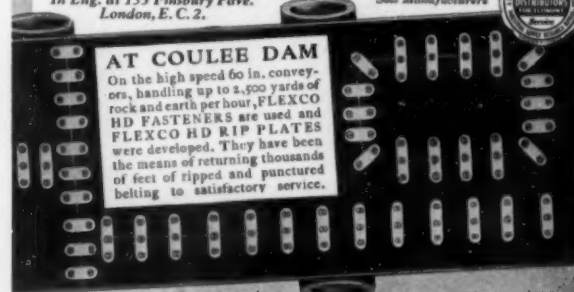
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London, E. C. 2.

Sole Manufacturers



AT COULEE DAM

On the high speed 60 in. conveyors, handling up to 2,500 yards of rock and earth per hour, FLEXCO HD FASTENERS are used and FLEXCO HD RIP PLATES were developed. They have been the means of returning thousands of feet of ripped and punctured belting to satisfactory service.

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---But So Is Quarry Haulage!



SHAYS are designed for haulage over steep grades, around sharp curves and over light track—the very problems the quarry engineer must solve.

With Shays every wheel is a driving wheel; every pound of weight, adhesive weight. A three cylinder engine drives through a flexible shaft geared to the

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For economical, low cost haulage the Shay locomotive offers maximum returns.

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LIMA, OHIO

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CRUSHERS

Single and double roll and jaw crushers, hammer mills, super dry pans—steel log washers and scrubbers, sand drags, revolving and vibrating screens, elevators, conveyors, dryers, jigs, noists.

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Complete portable, semi-portable and stationary crushing, screening, and washing plants for different capacities of any materials.



McLanahan & Stone Corp.

Established 1835
HOLLIDAYSBURG,
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WILFLEY centrifugal SAND PUMPS

for Slurries, Sand Tailings,
Slimes, Acid Sludges



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Continuous operation without attention for long periods. Stuffing box, stuffing, gland water ALL eliminated. Close clearances maintained by easy slippage seal adjustment. Heavy pumping parts of material best suited for YOUR particular problem. Complete engineering service. Prompt shipment of parts. The most efficient and economical pump you can buy.

A. R. WILFLEY & SONS, Inc., Denver, Colo., U. S. A.
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"We've Added a New Man to Our Sales Force!"

That's what a prospect told us recently when we suggested he advertise regularly in **ROCK PRODUCTS**. He seemed to think that by placing an additional man on his sales force he had solved his sales problem.

FORTUNATELY—we had no trouble convincing him that he could add 6000 salesmen to his sales staff by using **ROCK PRODUCTS** each month—that he could assist his new man to capitalize on his calls by making prospects familiar with his product through **ROCK PRODUCTS**—the paper which is always read by the busy executive.

*Why don't you add **ROCK PRODUCTS** to your sales force? It costs very little in comparison to its value.*

Classified Directory—Continued

Sheaves

Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Eagle Iron Works
Hais, Geo., Mfg. Co.
Hetherington & Berner, Inc.
Jeffrey Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Roebbing's, John A., Sons Co.
Sauerman Bros.

Shovels (Compressed Air)
Nordberg Mfg. Co.

Shovels, Power (Diesel, Diesel-Air, Electric, Gasoline, Gas-Electric, Oil & Steam)
Bay City Shovels, Inc.
Bucyrus-Erie Co.
Industrial Brownhoist Corp.
Koehring Co.
Link-Belt Co.
Northwest Engineering Co.
Thew Shovel Co.

Shovels (Tractor)
Bay City Shovels, Inc.
Koehring Co.
Link-Belt Co.

Shovels (Truck)
Bay City Shovels, Inc.
Thew Shovel Co.

Shovels (Underground)
Allis-Chalmers Mfg. Co.
Bay City Shovels, Inc.
Nordberg Mfg. Co.
Thew Shovel Co.

Shovel Repair Parts (Manganese)
American Manganese Steel Co.

Shredders
Williams Patent Crusher & Pulv. Co.

Sieves (Testing)
Hendrick Mfg. Co.
Roebbing's, John A., Sons Co.
Smith, F. L., & Co.
Tyler, W. S., Co.

Sifts
Blaw-Knox Co.
Chicago Bridge & Iron Co.
F. L. Smith & Co.

Silo Stave Machines (Concrete)
Besser Mfg. Co.

Slakers (Rotary)
Traylor Engineering & Mfg. Co.

Slugs (Grinding)
Smith, F. L., & Co.

Slurry Mixers
Hardinge Co.
Smith, F. L., & Co.
Traylor Engr. & Mfg. Co.

Slurry Pumps
Allen-Sherman-Hoff Co.
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Hardinge Co.
Morris Machine Wks.
Smith, F. L., & Co.
Wilfley, A. R., & Sons, Inc.

Slurry Pump Valves
Fuller Co.
Wilfley, A. R., & Sons, Inc.

Slurry Separators
Smith, F. L., & Co.

Slurry Thickeners
Hardinge Co.
Smith, F. L., & Co.
Traylor Engr. & Mfg. Co.

Smokestacks
Chicago Bridge & Iron Co.
Hendrick Mfg. Co.
Traylor Engineering & Mfg. Co.

Speed Reducers
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Smith, F. L., & Co.
Traylor Engineering & Mfg. Co.

Spouts
Jeffrey Mfg. Co.
Link-Belt Co.
Traylor Engineering & Mfg. Co.

Sprockets
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bacon, Earle C., Co.
Jeffrey Mfg. Co.
Link-Belt Co.

Standpipes

Chicago Bridge & Iron Co.
Ross Screen & Feeder Co.

Steel, Abrasion Resisting
Joseph T. Ryerson & Son, Inc.

Steel (Electric Furnace)
Chicago Steel Foundry Co.
Timken Roller Bearing Co.

Steel (Open Hearth)
American Manganese Steel Co.
Timken Roller Bearing Co.

Steel (Special Alloy)
Chicago Steel Foundry Co.
Timken Roller Bearing Co.

Stokers
Combustion Engineering Corp.
Link-Belt Co.

Storage Equipment
Barber-Greene Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Hais, Geo., Mfg. Co.
Jeffrey Mfg. Co.
Kern, Fred T., Co.
Link-Belt Co.
Robins Conveying Belt Co.
Sauerman Bros., Inc.

Stucco Colors
Mepharm, Geo. S., Corp.

Switchboards
Allis-Chalmers Mfg. Co.
General Electric Co.

Tachometers
General Electric Co.

Tampers (Power)
Besser Mfg. Co.
Multiplex Concrete Machy Co.

Tanks
Allen Cone & Machy, Corp.
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Chicago Bridge & Iron Co.
Chicago Pneumatic Tool Co.
Combustion Engineering Corp.
Eagle Iron Works
Hardinge Co.
Hendrick Mfg. Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Raymond Pulverizer Division
Traylor Engineering & Mfg. Co.

Tile Machines
Besser Mfg. Co.
Flam, Stephan
Multiplex Concrete Mach. Co.
R & L Concrete Machinery Co.

Towers
Blaw-Knox Co.
Eagle Iron Works
Hendrick Mfg. Co.
Jaeger Machine Co.
Robins Conveying Belt Co.
Sauerman Bros., Inc.

Track & Track Equipment
Besser Mfg. Co.
Carnegie-Illinois Steel Corp.
(United States Steel Corp. Subsidiary)
Easton Car & Const. Co.
Nordberg Mfg. Co.

Track Systems (Overhead)
Jeffrey Mfg. Co.
Link-Belt Co.

Tractors
Allis-Chalmers Mfg. Co.
Koehring Co.
Tractors (Electric)
Link-Belt Co.

Trailers
Allis-Chalmers Mfg. Co.
Easton Car & Const. Co.
Koehring Company

Transformers
Allis-Chalmers Mfg. Co.
General Electric Co.

Transmission Machinery
Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Jeffrey Mfg. Co.
Link-Belt Co.
SKF Industries, Inc.
Standard Pressed Steel Co.
Timken Roller Bearing Co.

Trucks (Agitator)
Blaw-Knox Co.

Trucks (Dump)
Ford Motor Co.

**Secure
Economical
Continuous
Operation**



WITH **SECO** VIBRATING
SCREENS
SCREEN EQUIPMENT CO.
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For weighing, feeding and proportioning materials accurately and automatically use the Weightometer and Feedweight.

Better production at lower costs. For continuous or batch operation, equipped to automatically totalize the weight of all material handled.

Ask for Bulletin No. 375.

MERRICK SCALE MFG. CO.

Passaic, New Jersey

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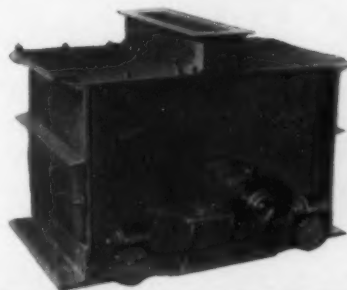


**Perforated Metals — Screens of
All Kinds — For Sand, Gravel,
Stone, Etc.**

MATERIAL IN STOCK
PROMPT SHIPMENT

CHICAGO PERFORATING CO.
2427 to 2445 West 24th Place
Tel. Canal 1489 CHICAGO, ILL.

"PENNSYLVANIA" REVERSIBLE HAMMERMILL

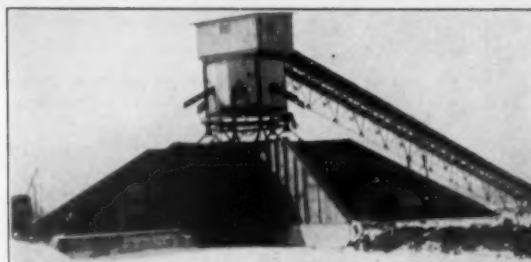


*has set up new
standards of effi-
ciency and reduced
overall costs.*

1. Daily reversal of rotor resharpens Hammers and Cage Bars. NO MORE MANUAL TURNING OF HAMMERS.
2. Duplex cages independently adjusted, to compensate for Hammer and Cage wear.
3. Major reduction by smashing head-on impact.
4. High Drop feed, placing material well in front of each Hammer.
5. Additional screening surface increases capacity of output.

**PENNSYLVANIA
CRUSHING COMPANY**

Liberty Trust Bldg.,
PHILADELPHIA, PA.

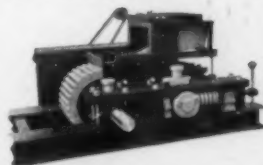


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COMPLETE PLANTS DESIGNED AND ENGINEERED
TO SUIT YOUR REQUIREMENTS

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NEW HOLLAND ROLL CRUSHER BUILT FOR PERMANENCE



New Holland 1938 model Roll Crushers are equipped with manganese sectional shells that reduce the replacement cost 50%.

The new all roller bearing Pulsating Feeder doubles the roll capacity, prevents peaks in the load and excessive wear on the shells.

Write for 1938 Roll catalog.

NEW HOLLAND MACHINE COMPANY
NEW HOLLAND, PA.

ASPHALT MIXING PLANTS



PORTABLE
and
STATIONARY

.. ALL SIZES ..

FOR HOT AND COLD MIXES
REPRESENTING THE
NEWEST DEVELOPMENTS
in ASPHALT PLANT ENGINEERING

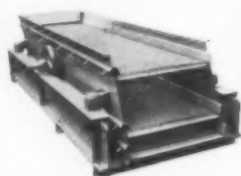
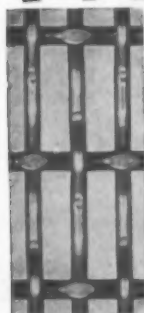
HETHERINGTON & BERNER INC.

ENGINEERS AND MANUFACTURERS

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INDIANAPOLIS, INDIANA

TYLER CIRCLE-THROW MECHANICALLY AND ELECTRICALLY-VIBRATED SCREENS



**and Woven
Wire Screen**
In all Meshes
and Metals
**Scrubbers
and
Dryers**

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3623 Superior Avenue Cleveland, Ohio



**AIR
COMPRESSORS**
ALL TYPES & SIZES



**ROCK
DRILLS**
SINKERS - DRIFTERS
WAGON DRILLS
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on Inside Front Cover
of Last Month's Issue

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BUCKETS**

**USE RIGHT BUCKET
FOR THE JOB**

Hayward makes all four—clam shell,
drag-line, electric motor, orange
peel. A Hayward recommendation is
unprejudiced.

THE HAYWARD COMPANY
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New York, N. Y.

Classified Directory—Continued

Truck Bodies (Dump)
Commercial Shearing &
Stamping Co.
Easton Car & Const. Co.
Ford Motor Co.

Trucks (Electric)
Easton Car & Const. Co.

Trucks (Gas-Electric)
Easton Car & Const. Co.

Trucks (Hand)
Standard Pressed Steel Co.

Trucks (Lift)
Besser Mfg. Co.
Flam, Stephan

Truck Skids (Lift)
Besser Mfg. Co.
Easton Car & Const. Co.

Trucks (Mixers)
Blaw-Knox Co.
Jaeger Machine Co.
Smith, F. L., & Co.

Tubing (Seamless Steel)
Timken Roller Bearing Co.

Turbines
Allis-Chalmers Mfg. Co.
General Electric Co.

Turnbuckles
Easton Car & Const. Co.
Macwhyte Co.

Unloaders
Barber-Greene Co.
Bucyrus-Erie Co.
Fuller Company
Hais, Geo., Mfg. Co.
Jeffrey Mfg. Co.
Link-Belt Co.
New Holland Machine Co.
Northwest Engineering Co.
Robins Conveying Belt Co.
Universal Road Machy. Co.

Unloaders (Boat)
Link-Belt Co.

Unloaders (Box Car)
Barber-Greene Co.
Besser Mfg. Co.
Fuller Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Universal Road Machy. Co.

Unloaders (Pneumatic)
Fuller Company

Unloaders (Underground)
Bay City Shovels, Inc.
Jeffrey Mfg. Co.
Nordberg Mfg. Co.

Ventilating Apparatus
Blaw-Knox Co.

Vibrators
Jeffrey Mfg. Co.
Link-Belt Co.
W. S. Tyler Co.

Wagons (Dump)
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Koehring Co.

Washers (Log)
Allis-Chalmers Mfg. Co.
Eagle Iron Works
Hardinge Co.
Jeffrey Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Smith Engineering Works
Traylor Engr. & Mfg. Co.

**Washers (Sand, Gravel and
Stone)**
Allen Cone & Mach. Corp.
Allis-Chalmers Mfg. Co.
Bacon, Earle C., Co.
Chicago Bridge & Iron Co.
Eagle Iron Works
Hais, Geo., Mfg. Co.
Hardinge Co.
Hendrick Mfg. Co.
Jeffrey Mfg. Co.
Lewistown Foundry & Mach.
Co.
Link-Belt Co.
McLanahan & Stone Corp.
Robins Conveying Belt Co.
Roebbing's, John A., Sons Co.
Smith, F. L., & Co.
Smith Engineering Wks.
Tyler, W. S., Co.
Traylor Engr. & Mfg. Co.
Universal Road Machy. Co.
Universal Vibrating Screen
Co.
Wickwire-Spencer Steel Co.

Weighing Equipment
Blaw-Knox Co.
Fuller Company
Hardinge Co.
Jaeger Machine Co.
Merrick Scale Co.

Welding and Cutting Apparatus
American Manganese Steel Co.
General Electric Co.
Roebbing's, John A., Sons Co.
Wickwire-Spencer Steel Co.

Welding Rods
American Manganese Steel Co.
Roebbing's, John A., Sons Co.
Ryerson, Jos. T., & Son, Inc.

Welding Wire
American Manganese Steel Co.
American Steel & Wire Co.
(U. S. Steel Corp. Subs.)
Roebbing's, John A., Sons Co.
Taylor-Wharton Iron & Steel
Co.
Wickwire-Spencer Steel Co.

Winches
Jeffrey Mfg. Co.
Link-Belt Co.
Robins Conveying Belt Co.

Wire Cloth
Bacon, Earle C., Co.
Cleveland Wire Cloth & Mfg.
Co.

Eagle Iron Works
Leschen, A., & Sons Rope Co.
Link-Belt Co.
Ludlow-Saylor Wire Co.
Robins Conveying Belt Co.
Roebbing's, John A., Sons Co.
Screen Equipment Co.
Tyler, W. S., Co.
Universal Vibrating Screen
Co.

Wire (Copper, Iron and Steel)
General Electric Co.
Roebbing's, John A., Sons Co.
Wickwire-Spencer Steel Co.

Wire (Electric)
General Electric Co.
Roebbing's, John A., Sons Co.
Wickwire-Spencer Steel Co.

Wire Rope
American Cable Co., Inc.
Bethlehem Steel Co.
Broderick & Bascom Rope Co.
(Yellow Strand)
A. Leschen & Sons Rope Co.
Macwhyte Co.
Roebbing's, John A., Sons Co.
Wickwire-Spencer Steel Co.

Wire Rope Clips
American Cable Co.
Bethlehem Steel Co.
Broderick & Bascom Rope Co.
Leschen, A., & Sons Rope Co.
Macwhyte Co.
Roebbing's, John A., Sons Co.
Wickwire-Spencer Steel Co.

Wire Rope Fittings
American Cable Co.
Bethlehem Steel Co.
Broderick & Bascom Rope Co.
(Yellow Strand)
A. Leschen & Sons Rope Co.
Macwhyte Co.
Roebbing's, John A., Sons Co.
Wickwire-Spencer Steel Co.

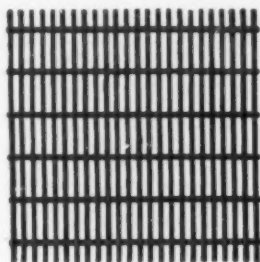
Wire Rope Hooks
American Cable Co.
Leschen, A., & Sons Rope Co.
Macwhyte Co.
Roebbing's, John A., Sons Co.
Wickwire-Spencer Steel Co.

Wire Rope Lubricants
Broderick & Bascom Rope Co.
Macwhyte Co.
Roebbing's, John A., Sons Co.
Texas Co.

Wire Rope Slings
American Cable Co.
Bethlehem Steel Co.
Broderick & Bascom Rope Co.
Leschen, A., & Sons Rope Co.
Macwhyte Co.
Roebbing's, John A., Sons Co.
Wickwire-Spencer Steel Co.

Wire Rope Sockets
American Cable Co.
Leschen, A., & Sons Rope Co.
Macwhyte Co.
Roebbing's, John A., Sons Co.
Wickwire-Spencer Steel Co.

Wire Rope Thimbles
Macwhyte Co.

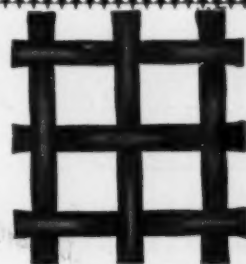


ALLOY
No. 2

STAR PERFORMERS

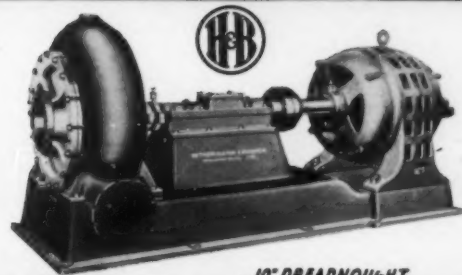
CLEVELAND SCREENS are star performers—returning larger capacities, increased profits and more accurate separations at lower cost. Cleveland Screens save money with the initial investment because, if they are made of the longer-wearing, wear-resisting ALLOY NO. 2—Cleveland Screens stay on the job long after ordinary screens would have been replaced.

★ **THE CLEVELAND WIRE CLOTH & MFG. CO.**
3574 E. 78TH STREET CLEVELAND, OHIO



2 Mesh .163 Ga.
MORE PROFITS FOR YOU

SAND and GRAVEL PUMPS



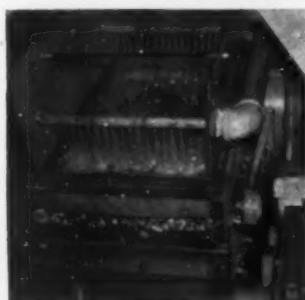
HETHERINGTON & BERNER INC.
701-745 KENTUCKY AVENUE INDIANAPOLIS, INDIANA

RYERSON *Certified* STEELS



RYERSON STOCKS INCLUDE:
Alloy Steels—Tool Steels
Stainless Steel
Cold Finished Shafting—Screw
Stock
Strip Steel, Flat Wire, etc.
Beams and Heavy Structural
Channels, Angles, Tees and Zees
Hot Rolled Bars—Hoops and Bands
Plate—Sheets
Boiler Tubes and Fittings
Mechanical Tubing—Welding Rod
Rivets, Bolts, Nuts, Washers, etc.

Ryerson Certified Steels represent the highest quality obtainable in each class and type of material. All kinds from standard carbon steels to special alloys are carried in a full range of sizes. Special quality and service features help users secure best results. When you need good steel, a single bar or a carload, phone, wire or write the nearest Ryerson plant, Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.



SELECTRO VIBRATING SCREEN

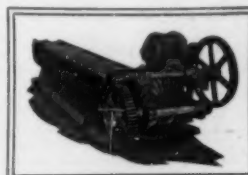
**WET OR DRY
COARSE OR FINE
SCREENING**

Write for
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21-K Gates (42"). 50" Superior McCully like new.
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- 1—4' Symons Cone Coarse Bowl Crusher.
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COMPLETE plants 165 yds. to 1600 yds. capacity includes aggregate bins—bulk cement bins—mixers—conveyors—elevators, etc.
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- 20" complete 110' centers.
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Idlers & Drives for 18, 24, 30 & 36".

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125 HP Erie Economic Boiler.
3 Ton 48" Span O.E.T. Shop Cranes.

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450 Steel Pallets. Bargain. Address Box 831, care of Rock Products, 205 W. Wacker Drive, Chicago, Ill.

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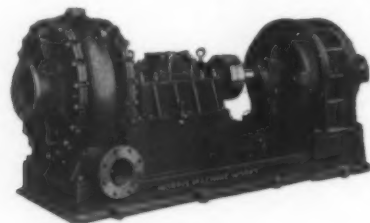
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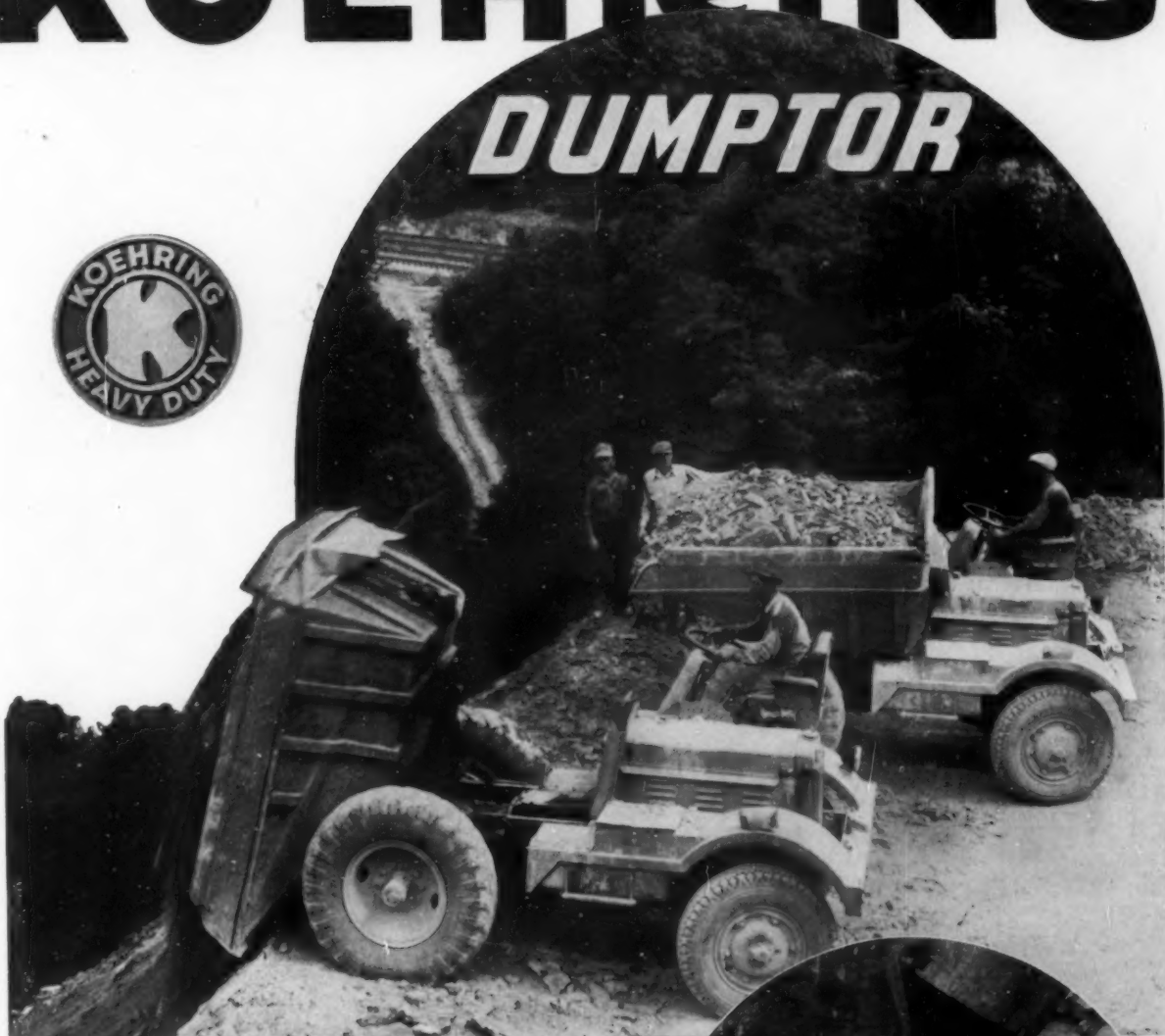
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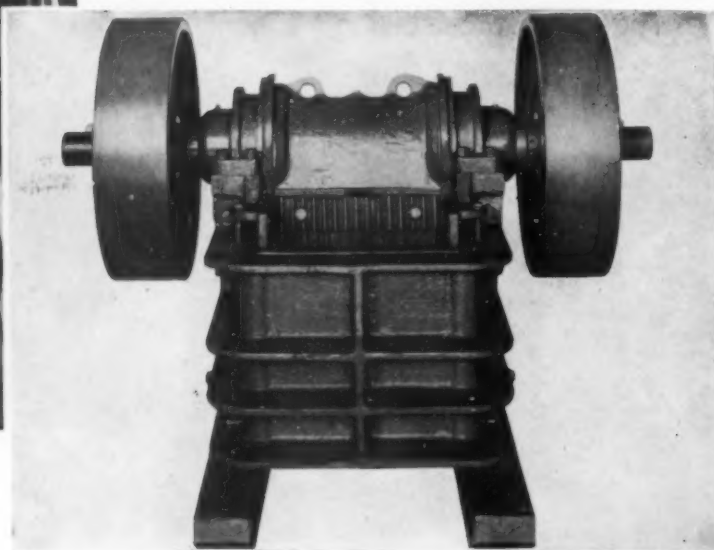
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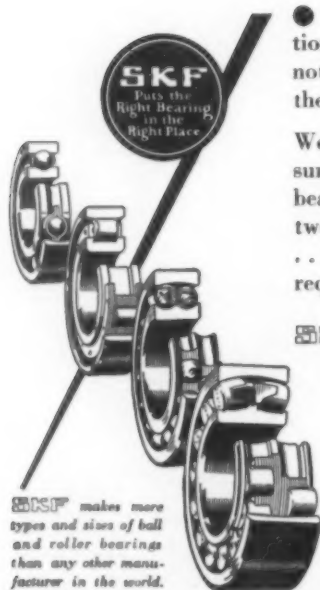


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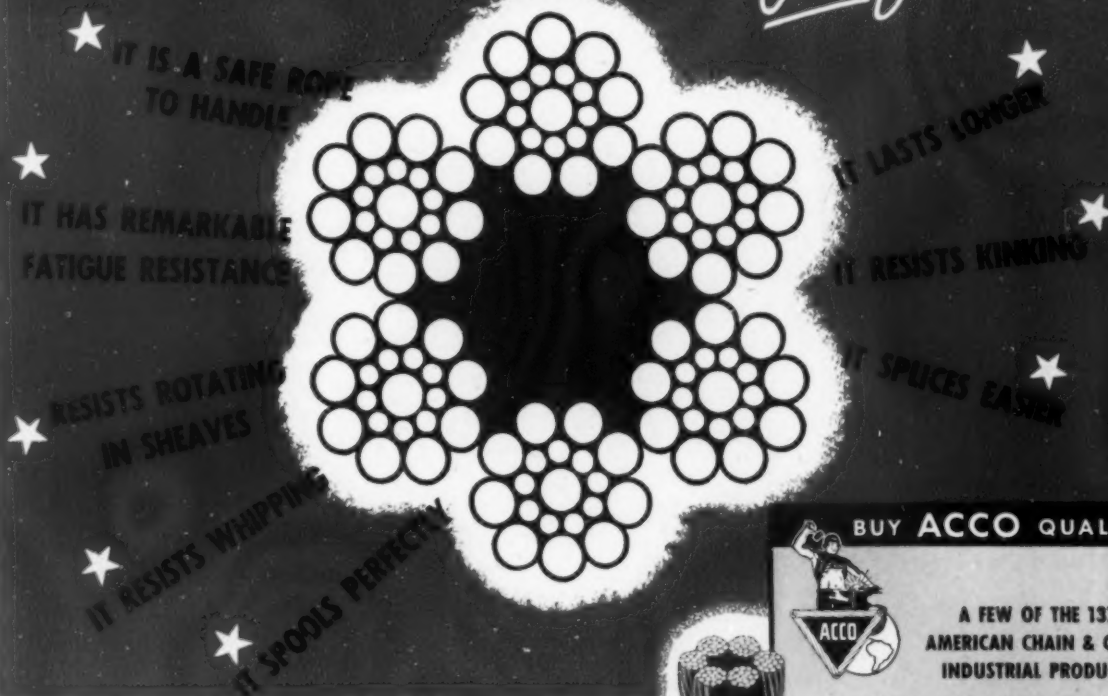
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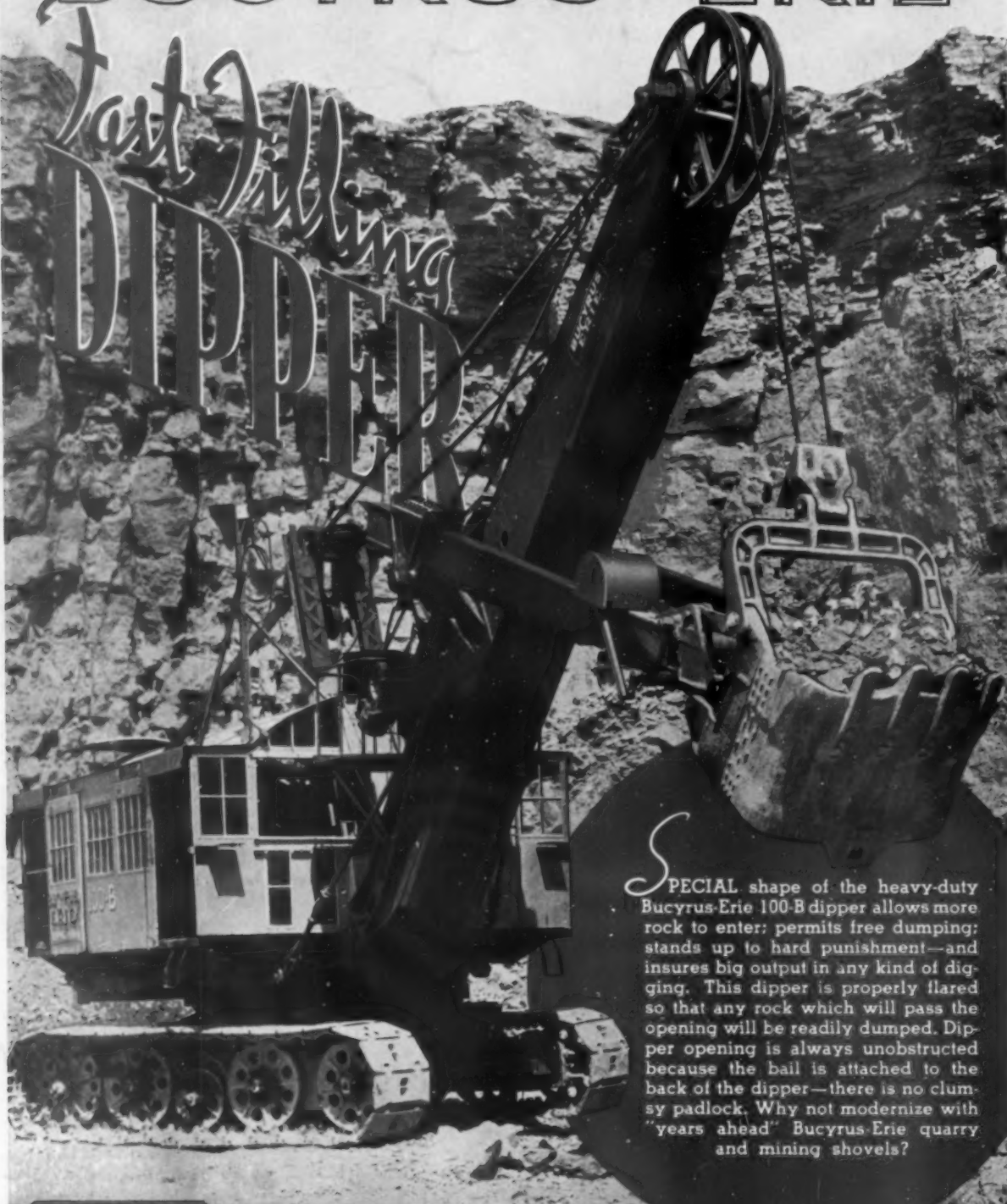
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